

# NETWORK WORLD

The Newsweekly of User Networking Strategies

Volume 8, Number 40

An International Data Group Publication

October 7, 1991

## IBM net exec shares vision of the future

By Barton Crockett  
Senior Editor

LA GAUDE, France — The director of IBM's network laboratories discussed plans last week to roll out within three years a high-speed asynchronous transfer mode (ATM) switch, an ISDN switch and peer-to-peer networking capabilities for the 3745 front-end processor.

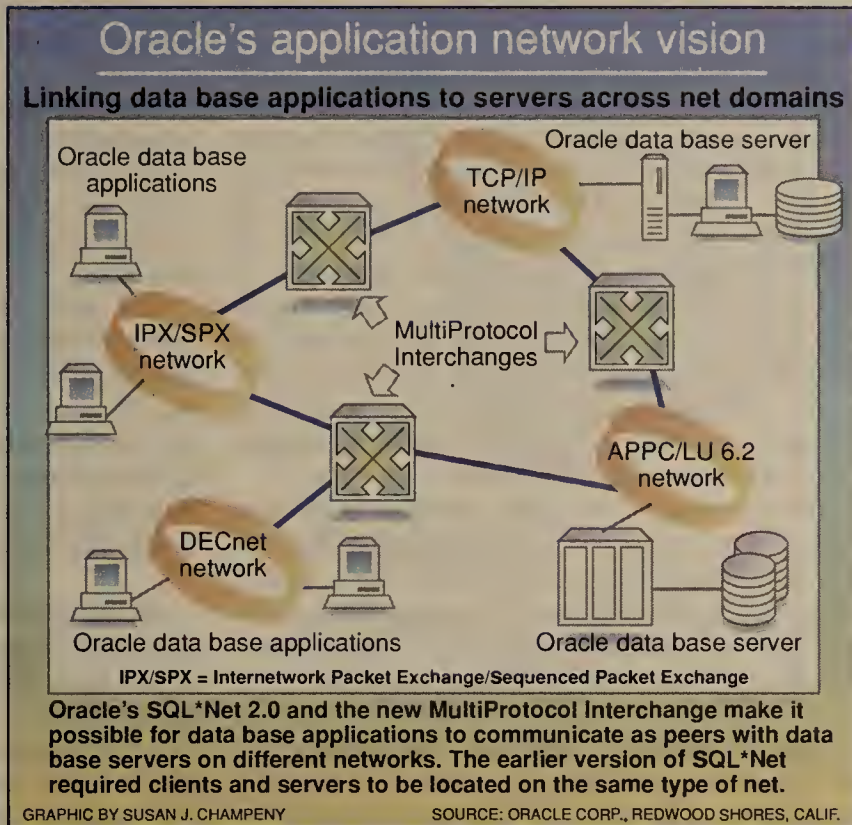
Georges Commagnac, director of network hardware development, said IBM is also considering plans for new wireless local-area network products.

**IBM at work on new version of APPC software for DOS machines. See story, page 2.**

During a private interview at IBM's network hardware research and development laboratory here, Commagnac said the new products will help IBM meet customer demand for emerging technologies.

The ATM switch, code-named Paris, will be IBM's first fast packet switch.

Paris will be positioned as a so-called transport network node because it will support private backbone networks operating at 140M bit/sec, Commagnac said.  
(continued on page 100)



## LAN growth forces users to mull backbone options

By Paul Desmond  
Senior Editor

As LAN internetworks grow ever larger, users will be faced with the task of deciding which backbone network topologies and equipment can meet their needs most efficiently and cost-effectively.

Although most users today are simply expanding their internetworks by adding routers and circuits, the mushrooming line costs associated with that approach

will eventually force an evaluation of other options.

For many, the answer will be deployment of a more hierarchical topology consisting of regional hubs linked to surrounding branch sites using frame relay as the transport method of choice.

The question then becomes, what is the optimum hub device? While the most obvious choice may appear to be a high-capacity router, vendors of packet switch-  
(continued on page 7)

## Oracle widens DBMS access across nets

SQL\*Net upgrade enables local users to access data on DBMSs scattered across various nets.

By Timothy O'Brien  
West Coast Bureau Chief

REDWOOD SHORES, Calif. — Oracle Corp. last week announced a new version of its SQL\*Net remote data access software and a new companion product that will enable Oracle data base applications to access servers across different types of networks.

Since Oracle's existing data base products can only share information over networks based on the same protocol, the new version paves the way for true distributed data base management.

"With this new software, it is possible to have distributed applications across any networks using any protocols," said Smokey Wallace, vice-president and general manager of the Network Products division at Oracle.

Analysts agreed.

"It solves a particular problem, and even though it took them a long time to do it, they have finally done it right," said Paul Cabbage, staff analyst at Dataquest, Inc. in San Jose, Calif. "They now have a technological pathway to do new things in the future."

Although Wallace said the new software was developed to solve problems associated with Oracle's data base products, he did not rule out the possibility of extending the technology to other  
(continued on page 98)



Novell to unveil an architecture that will help vendors build hubs for NetWare servers and manage the devices from a common console. Page 6.

Alantec, Fibermux, Xyplex and others plan internetworking announcements. Page 6.

## DEC readies router, net mgmt. blitz

By Jim Duffy  
Senior Editor

SAN JOSE, Calif. — Digital Equipment Corp. this week is expected to unveil a low-end multi-protocol router, as well as enhancements to its DEC Management Control Center (DECmcc) Director network management system.

The announcements, slated for the INTEROP 91 Fall show here, will be accompanied by statements of direction on Open Systems Interconnection and support for IBM Systems Network Architecture routing as well as DEC's adherence to the Open Software Foundation, Inc.'s (OSF) Distributed Management Environment (DME). A DEC spokeswoman declined to comment on the announcements.  
(continued on page 98)

### NETLINE

**RECENT OUTAGES** prompt lawmakers to call for establishment of public network quality standards. Page 2.

**NSA TOOL LETS NETVIEW** manage SNA gateways and activity on Novell NetWare servers. Page 4.

**SUN LAUNCHES LINE** of multi-processor local network servers. Page 4.

**WANTED BY TCP/IP USERS:** network management applications to ease management tasks. Page 73.

**TRAVEL AGENCY** sends alligator packing after it creeps in from carrier's swamp. Page 78.

**DEC UNWRAPS** several net security packages, as well as services for setting and evaluating security parameters. Page 99.

### FEATURE

## Test, Buyer's Guide offer insights into 10Base-T nets

Network World/  
Enterprise Technology Center

**NETWORK TEST SERIES**

lines the results of stress tests on 22 leading 10Base-T cards. In addition, a Buyer's Guide to 10Base-T cards compares and contrasts the major features of 170 10Base-T offerings. The Buyer's Guide begins on page 43, and the test article starts on page 71.

With more than 100 vendors vying for your business in the 10Base-T market, making a purchase decision isn't easy.

To help you make the right choice, *Network World* presents two useful feature articles that give you an in-depth look at the 10Base-T products available today. A new Network Test Series article out-





# New DOS version of IBM's APPC requires less memory

Package to work with Windows, support CPI-C and consume half the memory of older version.

By Paul Desmond  
and Jim Duffy  
Network World Staff

RESEARCH TRIANGLE PARK, N.C. — IBM is internally beta-testing a new DOS version of its LU 6.2/Advanced Program-to-Program Communications software that may use only about half the memory of its existing APPC/PC product and work with Microsoft Corp.'s Windows 3.0.

In addition, IBM plans for the new version of the product to support its Common Programming Interface for Communications (CPI-C), the same programming interface its Systems Application Architecture (SAA) operating systems use with LU 6.2.

The software will encourage users to deploy DOS- and Windows-based applications that work in an IBM Advanced Peer-to-Peer Networking (APPN) net or that communicate with other LU 6.2-based applications by making it more efficient to run them on personal computers. The current APPC/PC product requires 225K bytes of memory, leaving little room for other applications on a DOS machine.

In addition, support for CPI-C should make it easier to develop DOS-based APPC applications.

According to analysts, the new DOS version of APPC will be a welcome, overdue addition.

(continued on page 97)

# Lawmakers call for quality standards in public nets

Demand the FCC toughen up and protect users.

By Anita Taff  
Washington Bureau Chief

WASHINGTON, D.C. — With the effects of several major carrier outages still vivid memories, rattled lawmakers last week called on the FCC to establish and enforce network quality standards to ensure the reliability of the public network.

At a sometimes volatile hearing before the House Subcommittee on Telecommunications and Finance, disgruntled lawmakers expressed exasperation over the reluctance of the Federal Communications Commission to do more to protect users by becoming involved in setting such standards.

Several congressmen also blamed the FCC for forging ahead with policies such as price cap regulation, which they say may have contributed to the outages, in the face of opposition by many users.

"The commission has pinned its hopes to the invisible hand of the marketplace, placing its bet that the forces of competition would promote network reliability and security," said Rep. Edward Markey (D-Mass.), chairman of the subcommittee. "When we look for the cause of the outages, we must look squarely at price cap regulation."

FCC Common Carrier Bureau  
(continued on page 102)

# Firms plan to jointly build integrated hub, routing tool

By Maureen Molloy  
Staff Writer

REDWOOD CITY, Calif. — Cisco Systems, Inc., SynOptics Communications, Inc. and SunConnect last week announced plans to jointly build a device that provides integrated hub and routing functions and can be managed from a single system.

The integrated hub/router, called a RubSystem, will enable users to route data over any of several hub buses or an integral high-speed routing bus. The data can be passed between different local-area networks attached to the hub or to wide-area network

circuits. This setup would be a vast improvement over router cards that reside in an intelligent wiring hub and use a much slower hub bus to route traffic across the hub or onto a WAN.

In addition, users would be able to centrally manage the hub and routing functions from a Sun-Net Manager operator console.

"What they're doing is building a better bus," said Jim Harrison, an analyst with the META Group in Westport, Conn. "The potential is there to jointly build a bus so you get better [routing] performance within the hub."

(continued on page 97)

## Briefs

**It's a wrap.** Apple Computer, Inc. and IBM last week officially signed joint development agreements announced in early July. Although there was little new information revealed last week, the companies did provide more details on upcoming products and their release dates. The new products are designed to better integrate the two firms' computer environments.

Apple has licensed IBM's Token-Ring Network technology for use in a product it declined to detail but said would be available later this year. Apple also said it would release a version of its Data Access Language (DAL) server for IBM's Application System/400. DAL is an SQL-based system that lets Apple Macintoshes access data on other machines.

Apple will also release a product called Apple-Talk Services for OS/2 that will let Macintoshes share files and services with DOS- and OS/2-based devices through an OS/2-based server. To achieve this interoperability, Apple will license the Apple-Talk protocol source code to IBM.

The companies also announced plans to give Macintoshes full access to IBM's Advanced Peer-to-Peer Network directory and routing services and to integrate Macintoshes into IBM's net management architecture through either IBM's LAN Network Manager or NetView. Details were not provided.

**Novell service accord expands.** Novell, Inc. this week will announce the addition of 13 members to its Technical Support Alliance — a group that provides customers with coordinated technical support in multivendor computing environments. Among the new members are such industry heavyweights as Cisco Systems, Inc., Digital Equipment Corp., GUPTA Technologies, Inc., Lotus Development Corp., NEC Technologies, SynOptics Communications, Inc. and Unisys Corp.

**BT's Concert lures new players.** StrataCom, Inc. and Telematics International, Inc. this week will announce support for British Telecommunications PLC's Concert integrated management system.

StrataCom plans to develop software that will feed alarm data from its StrataView Plus T-1 multiplexer management system to Concert access software, which translates data into Open Systems In-

terconnection formats. The link, scheduled for availability next summer, will initially support only the monitoring of StrataCom IPX networks from Concert.

Telematics will also announce support for Concert and plans to build fully OSI-compliant links that will enable Concert to support Telematics' line of X.25 packet switches and T-1 multiplexers.

**Agreement on SMDS.** The SMDS Interest Group last week agreed on a unified, open specification that will enable local-area network bridges and routers to connect to Switched Multimegabit Data Service networks via data service unit/channel service units (DSU/CSU).

The SMDS Data Exchange Interface incorporates features from two earlier proposals, one being a collaborative effort of Link Corp., Ungermann-Bass, Inc., Verilink Corp. and Wellfleet Communications, Inc., and the other coming from ADC Kentrox and Cisco Systems, Inc. The open interface is designed to promote interoperability of different bridge/routers and DSU/CSUs supporting SMDS traffic.

**Boeing lands a big one.** The U.S. Army Information Systems Selection and Acquisition Agency last week handed Boeing Computer Services Co. the Reserve Component Automation System (RCAS) contract, which is valued at up to \$1.6 billion over 12 years. Boeing will install and maintain a nationwide network for more than 4,700 locations where National Guard and Army Reserve units prepare for emergency mobilization. The network will link these units for the first time, allowing them to share data on personnel, equipment and mobilization schedules with the National Guard Bureau in Washington, D.C. and the Army Reserve headquarters in Atlanta.

**David opens up.** David Systems, Inc. is expected to announce at INTEROP 91 Fall this week a technology agreement with Hewlett-Packard Co. to migrate to HP's OpenView software for management of the company's DSI ExpressNet Hubs and Intelligent Concentrators, according to analysts. OpenView was recently selected by the Open Software Foundation, Inc. as the basis for its Distributed Management Environment.

## CONTENTS

### Industry Update

HP, Microsoft unite on Windows effort. 9  
Wellfleet signs AT&T to resell its internetwork gear. 9

### Telecommunications

AT&T points toward collusion in MFJ ban. 13  
Pacific Bell petitions utility for reduction in toll rates. 13

### Data Communications

AT&T charts course for BNS-1000 switch. 19  
Sync Research device cuts SNA/SDLC polling traffic. 19

### Local Networking

Physical LAN mgmt. still posing problems. 23  
Industry chiefs challenge rivals' latest developments. 23

### Management Strategies

Outsourcing unlikely to offer big savings. 27  
User learns hard lesson about disaster recovery. 27

### Global Networks

Muxes to route voice via switched circuits. 33  
Firms award pact for undersea link to USSR. 33

### Products & Services

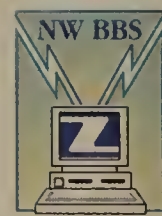
Stratus, AT&T unite on calling interface. 37

### Opinions

Documentation, training shouldn't be afterthoughts. 40  
Users won't see info services from the RBHCs this year. 41

### Action Center

Networking Marketplace 84  
Networking Careers 89



### NW Bulletin Board

Contact us electronically. Our BBS lets you submit letters to the editor, pass on tips, leave change of address requests, interact with other readers, download free software and hunt for jobs.

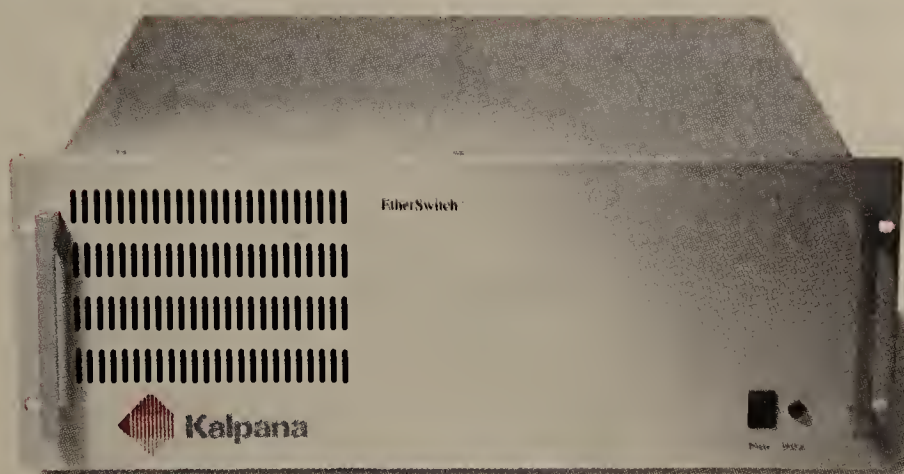
Use your IBM, Apple or other microcomputer to reach the BBS at 300 to 2,400 bit/sec (8N1) by dialing (508) 620-1160 or at speeds up to 9.6K bit/sec by dialing (508) 620-1178. You can speak to us directly by calling (800) 622-1108.

Article reprints (minimum 500 copies) can be obtained from Donna Kirkey, Network World, Inc., 161 Worcester Road, Framingham, Mass. 01701-9172; (508) 875-6400.





# BAIT. AND SWITCH.



## INTRODUCING THE ETHERSWITCH™ EPS-1500 — THE NEWEST ADDITION TO OUR GROWING FAMILY.

If the thought of boosting your Ethernet LAN throughput 600% is alluring, take a close look at the new EtherSwitch EPS-1500 from Kalpana. Through our innovative Ethernet switching technology, EtherSwitch gives you an immediate, affordable new alternative that increases your LAN throughput to 70 Mbit/s. All without the reconfiguration problems and traffic delays of bridges and routers. Or without the high cost of installing FDDI. You simply plug EtherSwitch into your existing network. And, as with a telephone PBX, instead of a single stream of data being sent one packet at a time, you get simultaneous transmission of multiple packets through the EtherSwitch. Through our ability to filter and forward 100% of all traffic and move an infinite stream of back-to-back packets without the loss of a single packet, you're assured of the high performance needed for demanding file server and network applications. All of which adds up to true *Parallel Networking*. With EtherSwitch you add new life and longevity to your network. You also protect hardware and software investments because EtherSwitch is transparent to all high-level protocols and compatible with IEEE 802.3 standards. Plus you'll prepare for the future. As network demands increase, just plug another EtherSwitch into your LAN. It's that simple. So if your Ethernet LAN continues to be slowed down by more data than it can handle, call Kalpana — the first name in *Parallel Networking*: 800-488-0775, extension #10. With 600% more throughput, we're committed to getting you off the hook.



## Kalpana

*The Parallel Networking Company*

125 Nicholson Lane, San Jose, CA 95134 (408) 428-1150  
EtherSwitch is a trademark of Kalpana Inc.





# NSA software lets NetView users manage gateways, NetWare servers

Pack provides basis for NetView control of remote LAN servers.

By Paul Desmond  
Senior Editor

LAGUNA HILLS, Calif. — Network Software Associates, Inc. (NSA) last week unveiled software that enables IBM NetView users to manage NSA's Systems Network Architecture gateway and monitor activity on Novell, Inc. NetWare servers.

The new NSA Network Manager enables NetView users to proactively query NSA's

AdaptSNA LAN Gateway, NetWare 2.X and NetWare 386 file servers. The software passes unsolicited generic alerts on gateway or NetWare error conditions to NetView. In addition, it lays the foundation for full-fledged NetView control over remote local-area network servers.

The DOS-based NSA Network Manager resides on the same DOS-based personal computer that supports NSA's gateway.

From there, it communicates directly with NetView as an entry point, meaning management data needs no intermediary conversion into NetView-compatible formats.

Russ Hertzberg, director of product marketing for NSA here, said the product covers three management categories: gateways, file service and a generic category. The latter can be used to manage any NetWare service that uses Novell's Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX) protocol and the Service Advertising Protocol (SAP).

Through a single AdaptSNA gateway, NSA Network Manager supports the monitoring of as many as 100 additional NSA or non-NSA gateways, NetWare file servers and NetWare services.

The product has the greatest control over the AdaptSNA gateway. It employs NetView execute commands to allow a NetView operator to remotely shut down and reboot a gateway as well as initiate diagnostic dumps and traces.

Those functions are supported for AdaptSNA gateways attached to any Network Basic I/O System-compatible LAN, not just NetWare LANs, Hertzberg said.

Among the generic alerts NSA Network Manager can forward to NetView are those for excessive receive and transmit retransmissions as well as various Synchronous Data Link Control protocol violations, such as short or long packets, he said.

The product also lets NetView operators  
*(continued on page 102)*

## How To Manage Rush Hour On The LAN/WAN Throughway.

As geographically dispersed LANs become common, the need for higher throughput speeds becomes crucial. Count on Hughes Network Systems for innovative solutions. Our new Frame Relay Switch 9000™ is based on a new hardware platform and emerging frame relay access standards, yet is totally integrated with existing X.25 and multiprotocol product lines. This unified system solution is exciting news for forward thinkers who want frame relay's faster throughput...and reassuring news for practical thinkers who worry about product obsolescence. In giving you the best of both worlds, we haven't given you any loss in performance. FRS 9000™ makes maximum use of the bandwidth to accommodate sudden traffic surges, making it ideal for applications such as LAN to LAN integration and image transmission. Access speeds match T1/E1 rates. Throughput approaches 4000 frames per second per connection. Network management control is complete. Reliability is unsurpassed. Hughes Network Systems is the first packet switch vendor to the market with frame relay backbone and access. Now make it your first priority to find out more. In the U.S.A. call (301) 428-5500, ext. 3751, or fax (301) 428-1868. Or write us at 11717 Exploration Lane, Germantown, Maryland 20876, USA.

Frame Relay Switch 9000 and FRS 9000 are trademarks of Hughes Network Systems, Inc.

**HUGHES**  
NETWORK SYSTEMS

The winning edge in  
communications worldwide

**HUGHES**

Subsidiary of  
GM Hughes Electronics

Circle Reader Service #111

## Sun adds new multiprocessor line of servers

By Joanne Cummings  
Staff Writer

MOUNTAIN VIEW, Calif. — Sun Microsystems Computer Corp. (SMCC), a business unit of Sun Microsystems, Inc., last week unveiled a line of multiprocessing servers, a multiprocessor version of its Solaris Unix operating system and new server management software.

The company said it hopes the multiprocessing capabilities, modularity and high throughput of the new server line will help it garner a share of the mid-range server market. Until now, Sun had only offered smaller work group-type servers.

While analysts conceded that the new servers offer a significant jump in capability compared with Sun's previous offerings, they said the company is just keeping pace in the Unix mid-range market.

"With this announcement, Sun is saying that they're not in the lead but they're still a contender," said Rikki Kirzner, a senior industry analyst at Dataquest, Inc. in San Jose, Calif.

SMCC's SPARCserver 600MP Series includes three stand-alone multiprocessor servers — the SPARCserver 630MP, 670MP and 690MP. The products are designed to replace Sun's existing SPARCserver 330, 470 and 490 systems. Users can upgrade old servers to the 600MP Series by swapping the CPU board with a 600MP CPU module. The cost to upgrade a SPARCserver 490 to a 630MP is \$26,495.

The 600MP models come with two or four 40-MHz scalable processor architecture (SPARC) microprocessors. Two-processor machines can be upgraded to four-processor versions by plugging a SPARC-  
*(continued on page 102)*

**We want to hear from you. Network World** has set up a toll-free number



you can use to leave news tips or letters to the editor. Let us know what's going on or how you feel about the stories you read in our publication. Call (800) 622-1108 and ask for Ext. 487.





**Finally a wide area network that doesn't run like one.** Does this sound familiar? You're running a distributed LAN application in New York, and the moment you send it over your T1 backbone to the West Coast, it slows to a crawl. Why should that be? Why can't a WAN act more like a LAN? Well, now it can. With our FastPacket IPX® switch and our Frame Relay interface.

See, LANs are fast because they give you all their bandwidth for short periods of time. But T1 circuit switches do just the opposite. They give you a little bandwidth all the time. No wonder things go so slow.

With FastPacket®, though, your applications can fly. It's the one and only T1 switch technology that gives you instant access to *all your bandwidth all the time*. Add our Frame Relay interface, and your wide area network can perform like one of the locals. How fast is that? One customer cut his remote file access time from 2 minutes to a hare-raising 11 seconds, without buying any more bandwidth. Just Frame Relay running on FastPacket.

Of course, this nimble FastPacket network can also carry your voice, video, and non-frame relay data with the same results. While carrying your company into the near future, where FastPacket today enables simple ATM upgrades tomorrow to access a whole new world of public cell-based services.

Customers all over the world are enjoying FastPacket performance this very minute. You can, too. Jump on the phone and call us at 1-800-537-7707. That way you won't wake up someday and find out the race is over. And you didn't win.

  
**STRATACOM®**  
The FastPacket Company™

*Don't miss us at NETWORLD on October 15-17, Booth #2570.*



# Novell preps specifications for server-based LAN hubs

By Caryn Gillooly  
Senior Editor

SAN JOSE, Calif. — Novell, Inc. is expected to unveil at INTEROP 91 Fall this week a hub

management architecture that will enable vendors to build board-level hubs that fit into NetWare servers.

The architecture will include a

Hub Management Interface (HMI) specification to which hardware vendors can build, a hub management utility and a Simple Network Management Protocol (SNMP) agent. Those three elements combined will make it possible to manage server hubs and servers through a central management console.

In conjunction with the an-

nouncement, Cabletron Systems, Inc. is expected to introduce the first server hubs conforming to the Novell specifications.

Novell will also announce that four microprocessor designers, 21 interface card makers and three computer manufacturers have agreed to support the HMI interface. Companies involved include Advanced Micro Devices,

David Systems, Inc. and SynOptics Communications, Inc.

For users, the primary advantage of the architecture will be a decrease in the price of hub capabilities and centralized management of servers and the hub.

Hub cards for servers will appeal to companies that don't want to buy the add-ons associated with a hub, said Todd Dages, director of data communications research and consulting at The Yankee Group in Boston. Hub cards will be less expensive than existing hub products because they will run off the server's power supply and share its chassis, among other things.

Dages predicted that this announcement could drive the cost of hubs down to \$50 per port vs. (continued on page 103)

## ONLY THROUGH SHEER LACK OF DEDICATION, FRACDIAL™ BRINGS YOU...

Affordable,  
Dial-up,  
1.344 Mbps,  
Data Transmission

Sometimes dedication just gets in the way.

That's why we created **Fracdial**. Now you no longer need dedicated T-1 lines for high speed, high quality data and image transmission.

Available today, **Fracdial** works with all digital carrier networks, switches, and your current equipment, as well as most digital PBXs. What's more, anyone can operate **Fracdial** — it's push-button easy!

**Fracdial** automatically dials multiple *non-contiguous* circuits across any digital network — public or private. It divides your data among these circuits and then synchronizes them at the other end into a single stream of data at any bit-rate you want. Up to 1.344 mega-bits per second.

**Fracdial** has already found wide application. Hospitals use it to transmit diagnostic quality radiology images. Major corporations use **Fracdial** to connect their local area networks. And, **Fracdial** has made real-time, high quality video conferencing more widely available and affordable than ever. Plus it's the perfect solution for backing up your critical T-1 lines.

Has dedication blocked your communications capabilities? Call, write, or fax today, and see what **Fracdial's** lack of dedication can do for you.



*Fracdial is push-button easy.*

### DIGITAL ACCESS

11501 SUNSET HILLS ROAD, SUITE 200  
RESTON, VIRGINIA 22090  
IN VA: (703) 471-5010  
TOLL FREE: 1-800-666-2325  
FAX: (703) 471-4848

Fracdial is a trademark of Digital Access Incorporated

## Internetwork tools shine at INTEROP

By Maureen Molloy  
and Joanne Cummings  
Network World Staff

SAN JOSE, Calif. — The INTEROP 91 Fall conference here will play host to a variety of vendors introducing internetworking products, including Fibermux Corp., Network Application Technology (NAT) and Xyplex, Inc.

NAT and Xyplex will each unveil products that support remote Ethernet local-area networks, including bridges, routers and an Ethernet traffic monitor. Fibermux will be announcing Fiber Distributed Data Interface support for the company's Crossbow intelligent wiring hub.

Boxborough, Mass.-based Xyplex will announce the 6220 remote Ethernet router and the 6710 Router Card for its intelligent hub. Both support transmission speeds up to 256K bit/sec and frame relay service on the wide-area network side, as well as Transmission Control Protocol/Internet Protocol and Novell, Inc. Internetwork Packet Exchange (IPX) traffic.

They also support the Open Shortest Path First and Point-to-Point Protocol (PPP) routing protocols.

Routing support for Digital Equipment Corp.'s DECnet Phase IV and Apple Computer, Inc.'s AppleTalk is expected to be available in the second quarter of 1992 via a software upgrade. Additionally, both routers will support Simple Network Management Protocol (SNMP) standards.

The 6220 router costs \$4,495, and the 6710 router module costs \$3,495. Both will begin shipping by year end.

Xyplex will also announce a (continued on page 100)



## LAN growth forces users to mull options

*continued from page 1*

es and T-1 multiplexers claim they too can play a role because of their expertise in wide-area networks.

There are a number of factors that will influence the way internetworks evolve. For one, public frame relay services may offer a viable option to private backbones supporting frame relay. But companies with available bandwidth on existing voice/data backbones might want to piggyback local-area network traffic on that infrastructure.

Pricing for frame relay services, which is only now emerging, will also be a significant factor, said David Owen, strategic product planning director at Network Equipment Technologies, Inc. (NET).

If tariffs are distance-independent, such as those recently announced by BT North America, Inc., the service might be used to connect offices nationwide, Owen said. If not, users may want to employ frame relay to connect branch offices to regional hubs, then use high-capacity private lines between hubs.

Although the cost-effectiveness of the service mix may ultimately influence decisions about LAN internet backbones, the available hub technology may be given equal weight.

Router vendors say they are most experienced in routing LAN traffic and their products are the optimum choice. They also tout the large capacity of their wares.

Cisco Systems, Inc.'s AGS+, for example, supports as many as 28 T-1s, and the company recently announced support for 45M bit/sec T-3 links. Similarly, Wellfleet Communications, Inc.'s recently announced Backbone Node router is based on a 1G bit/sec backplane bus and promises a level of reliability not found in existing products. It is scheduled to ship in the second half of 1992.

Analysts and competitors, however, are quick to point out the limitations of routers as regional hubs.

"The physical design, redundancy and industrial-strength packaging isn't there," said Jeff Held, a principal at Ernst & Young, a consultancy in Vienna, Va., which is also testing Sprint Data Group's frame relay service. "It's coming, however. The new Wellfleet box is much closer to that."

### The packet players

Larry Mauceri, senior director of product planning for Hughes Network Systems, Inc., argues that packet switches adapted for frame relay offer unique advantages for LAN internet backbones.

Products such as Hughes' offer the ability to control and distribute software, have redundant data bases for network configuration and have advanced flow control mechanisms. The switches also support detailed accounting and billing features that help users identify and optimize traffic patterns.

Such capabilities separate Hughes from router vendors, Mauceri said. "Theirs is an infant product evolving from the access side. Ours is a veteran product evolving from the wide-area network side," he said.

The packet-switched backbone alternative is perhaps strongest in environments where it is also desirable to support other types of traffic — such as Systems Network Architecture — which are not addressed as well by routers, Mauceri said.

Perhaps the single biggest shortcoming

of both packet and router products, however, is that they only support data. "The typical backbone today still supports voice, data and video," said Jim Babcock, vice-president of product marketing at Timeplex, Inc.

Resiliency is the principal advantage of products from major T-1 vendors such as NET, Newbridge Networks, Inc., and Timeplex, Held said. Their products are mature devices with a proven ability to withstand hardware and circuit failures without disrupting network traffic.

The vendors are now building packet processing and routing capabilities into their multiplexers to address LAN interconnection and frame relay.

The problem with that approach is us-

ers must dedicate a fixed amount of bandwidth on their circuit-switched backbones for use with frame relay applications, which means bandwidth is not used as efficiently as with packet switches.

That limitation is changing, however. Netrix Corp.'s combined circuit/packet switch, for example, lets users dedicate the entire backbone bandwidth to frame relay but specify some channels for circuit-switched applications. When the circuit-switched applications are inactive, the bandwidth allocated is automatically reverted to the frame relay pool.

StrataCom, Inc. supports all traffic over a packet-based bus and, therefore, offers much the same capability as Netrix. Held contends it won't be long before other T-1

multiplexer vendors follow suit.

For its own use, Ernst & Young has yet to make a decision on which type of device it will ultimately use to support its internet traffic, although it is testing a public frame relay service with Cisco routers.

However, Held expects the company will eventually use bandwidth managers at major nodes but wants to see the routers incorporated within the multiplexer. "Today, those products aren't mature enough — and cheap enough, frankly — for us to use," he said.

"The only way to stay on safe ground here is to look into the relatively near future and try to make sure that any investment you make can be justified in a two- to three-year period," Held said. ■



**FLOORS, CEILINGS, WALLS, CONCRETE,** brick, glass . . . even metal filing cabinets are totally transparent with California Microwave's new *RadioLink*<sup>™</sup> LAN.

What IS solid is the signal.

Using advanced microwave technology, *RadioLink* lets you configure your LANs just about anywhere, interference free. Nor do you have to worry about "hidden" nodes. This is one wireless LAN you can count on to find and communicate with every single computer on your net.

But reliability is only part of the story.

*RadioLink* is designed to work flawlessly with multiple sub-networks, simultaneously. That means dramatically increased network data throughput.

For the total story on this new worry-free, wireless LAN by the microwave communications professionals, please call our *RadioLink* Hotline.

**1-800-772-LINK**  
(5465)

California Microwave, Inc.  
985 Almanor Avenue  
Sunnyvale, CA 94086  
TEL: (408) 732-4000  
FAX: (408) 732-4244

**CALIFORNIA  
MICROWAVE**

*RadioLink* is a trademark of California Microwave

Circle Reader Service #121



# Network tall buildings in a single bound.

With Chipcom's ONline™ System Concentrator you can connect a tall building or a far-flung campus with a seamless, unified and totally reliable network. A network that is truly self-healing, and capable of surviving multiple faults, from broken cable to failed modules or power supplies.

The ONline Concentrator is an intelligent wiring hub that handles all media, including coax, fiber and twisted pair. Its TriChannel™ architecture lets you configure up to three networks on each hub in any combination of Ethernet, Token Ring and FDDI.

Other network management systems merely allow you to perform an autopsy after your network has died. Chipcom's

new Network Control System does much more: It provides instant CPR to keep your network alive by automatically rerouting itself around a failed component. And it lets you reassign, balance and reconfigure without setting foot in a wiring closet.

Using Chipcom's ONline System Concentrator as your network platform, you can build a network with the reliability, flexibility and manageability necessary to take it into the 21st Century.

And just think what  
a super hero that will  
make you.

# BECOME A HERO.

Learn how to conquer the major causes of network failures. For your free copy call **1-800-228-9930**.

GSA# GS00K90AGS5185

# NETWORK RELIABILITY



# CHIPCOM™

**See us at Interop Booth # 3126  
and Network World Booth # 3715.**

Circle Reader Service #106

ONline and TriChannel are trademarks of Chipcom Corporation.

© 1991 Chipcom Corporation, Southborough Office Park, 118 Turnpike Road, Southborough, MA 01772





# INDUSTRY UPDATE

VENDOR STRATEGIES, MARKET TRENDS AND FINANCIALS

## Worth Noting

“We see frame relay as one of the enablers for the proliferation of internetworking technology. That’s why it’s important for us to go after forming close relationships with the carriers.”

**Gary Bowen**  
Senior vice-president of  
marketing and field operations  
Wellfleet Communications, Inc.  
Bedford, Mass.

## People & Positions

**Gandalf Technologies, Inc.** last week announced a restructuring following its merger with Infotron Systems Corp., under which Gandalf will focus on investment matters.

That effort will be directed by **Desmond Cunningham**, Gandalf’s chairman and chief executive officer, and **Jim Hahn**, who has been named to the newly created position of vice-president for technology investment. Hahn had been a director at Infotron.

Gandalf has established its Canadian operations under the name **Gandalf Canada, Ltd.** **John Wandell**, formerly senior vice-president of marketing at Gandalf, was named president of the new firm. Other worldwide activities will fall under the jurisdiction of another new company, **Gandalf Data, Ltd.** **Jan Bartl**, formerly senior vice-president of technology and products at Gandalf, will assume the reins as president.

**Hewlett-Packard Co.** last week named **Gary Eichhorn**, previously a vice-president at Digital Equipment Corp., as general manager of HP’s Workstation Business Unit. Eichhorn will be responsible for the worldwide development, marketing and business management of HP’s workstation products. ■

## Ringling endorsements for Wellfleet

### Company’s recent agreements with long-haul carriers

- AT&T Network Systems group will sell Wellfleet routers as LCS 200 Network Routers as part of AT&T’s new BNS-1000 product line.
- MCI Communications Corp. announced that it will deploy Wellfleet routers as part of its own frame relay network platform.
- US Sprint Communications Co.’s Sprint Data Group will resell Wellfleet routers under the SP8200 label as front ends to its frame relay service.

**WELLFLEET**  
communications

GRAPHIC BY TERRI MITCHELL

SOURCE: WELLFLEET COMMUNICATIONS, INC., BEDFORD, MASS.

## Wellfleet signs AT&T to resell its internetwork gear

Deals with all 3 IECs give a plus to Wellfleet users.

By **Bob Brown**  
Senior Editor

BEDFORD, Mass. — Wellfleet Communications, Inc. last week announced that AT&T Network Systems will market its line of bridge/routers on a private-label basis as part of AT&T’s new BNS-1000 Broadband Networking Family of products.

Wellfleet has now inked accords with all the major long-haul carriers, possibly giving the internetworking equipment vendor a leg up on some rivals, analysts said.

With AT&T, MCI Communications Corp. and US Sprint Communications Co. all marketing the vendor’s gear, Wellfleet can now make an argument that users installing its routers gain access to a variety of carriers’ switched digital services that are ideal for establishing on-demand links between local-area networks.

By contrast, rival Cisco Systems, Inc. has a reseller agreement with AT&T, while MCI and US Sprint simply refer customers to Cisco on an individual basis.

In a related move last week, US Sprint certified Cisco’s routers as the first LAN routers capable of operating with its frame relay service. Analysts, however, still think Wellfleet’s carrier deals could translate into a market edge. In a research note issued last month, Goldman, Sachs & Co., a securities firm in New York, reaffirmed that Wellfleet stock is a good buy while slightly downgrading its rating of Cisco. Goldman, Sachs was one of Wellfleet’s underwriters.

“If carriers specify that Wellfleet routers are to be used to access [certain] services, Wellfleet will have an important competitive advantage,” the firm stated in the note. Router sales associat-

ed with carrier agreements will depend largely on how aggressively the carriers price their new services.

Wellfleet received more good news last month when MCI said it would use the company’s routers as part of its frame relay network platform. The carrier may provide users with a Wellfleet node to access the frame relay service or provide software to upgrade users’ existing Wellfleet routers to access MCI’s frame relay ser-

**W**ellfleet can now make an argument that users installing its routers gain access to a variety of carriers’ switched digital services.

▲▲▲

vice. Details are still sketchy, however.

US Sprint’s Sprint Data Group last month said it will private-label and resell Wellfleet’s entire line of bridge/routers under the SP8200 label. US Sprint will sell the routers as a front end to its new frame relay service and add support for the routers under its network management systems.

AT&T Network Systems said it will private-label and resell Wellfleet’s products as the LCS 200 Network Routers to be included in AT&T’s new BNS-1000 product line. AT&T Computer Systems has been selling Cisco routers and NCR Corp. has been selling Wellfleet routers, setting up a

(continued on page 12)

## HP, Microsoft unite on Windows effort

HP pledges to adopt OLE object-oriented API, while Microsoft will embrace NewWave features.

By **Ellen Messmer**  
Washington Correspondent

REDMOND, Wash. — Hewlett-Packard Co. and Microsoft Corp. recently said they will cooperate to meld the capabilities of HP’s NewWave desktop manager with an object-oriented programming interface for Windows, a move geared to spur development of network applications.

The effort is aimed at giving software developers the best features of both offerings, which they can use to develop net applications that operate in both NewWave and Windows environments.

The agreement enables Microsoft to adopt some object-oriented features present in NewWave for its Object Linking and Embedding (OLE) specification, which enables Windows applications to work together. In addition, HP will bundle OLE support into NewWave.

“Microsoft and HP were on somewhat parallel tracks, and our agreement ensures that there is now a single track for the development community to get both OLE and NewWave functional-

ity,” said Steve Ballmer, senior vice-president of systems software at Microsoft.

Previously, developers had to write additional code to enable Windows-based applications to take advantage of NewWave.

Now both vendors are cooperating to create a single development path for NewWave and Windows applications. They are also attempting to make standard OLE applications for Windows capable of using many NewWave features without requiring any additional effort on the part of application developers.

OLE enables Windows-based applications to work closely together, even if those applications have been developed by different vendors using incompatible data formats.

### Root of the problem

Kevin Schofield, HP’s product marketing manager for NewWave, said the next version of NewWave, which will include support for OLE, will ship sometime this winter.

In return, Microsoft is expected (continued on page 12)

## INDUSTRY BRIEFS

**UB teams up on joint venture in Japan.** Ungermann-Bass, Inc. and SoftBank Corp., a Tokyo-based network products supplier, last week announced the formation of a new joint venture in Japan.

The new company, called NetPRO Consulting Corp., is designed to provide research and development, as well as support and training, for the Japanese local-area network market. The company will serve users of multivendor networks with a special emphasis on the Novell, Inc. and Microsoft Corp. server software markets.

SoftBank will own 60% of NetPRO, while Ungermann-Bass will own 35% and the remainder of the company will be owned by several other companies.

Ungermann-Bass, based in Santa Clara, Calif., already has several Japanese subsidiaries and joint ventures, including Ungermann-Bass K.K., Net One Systems and Matsushita Net One.

**PacTel reaffirms job reductions.** Pacific Telesis Group last week announced plans to ensure it will meet its previously stated goal of cutting about 11,000 jobs by 1995. The plans include voluntary severance and pension enhancements for management employees.

The company expects about 3,000 managers — approximately 17% of its management force of 18,400 — to take advantage of the work force reduction plan. The impact of the plan on the carrier’s financials will not be clear until the

(continued on page 12)





## Nothing supports your business

We're big on customer service. Customer service can be the most important thing we do, we know that. Therefore, our account teams are committed to understanding your specific needs, and have the resources to address them.

Resources like our Customer Service Centers, that are manned by handpicked service experts and equipped with state-of-the-art fingertip technology. From there, we can actually monitor your network end-to-end, isolate faults, and

initiate immediate repair.

When it comes to answering and anticipating customer requests for new product features and enhanced functionality, AT&T can respond like no one else. Because unlike any other T1 provider, we can call on AT&T Bell Laboratories, world-renowned for their innovations.

We also have state-of-the-art capabilities that allow us the most efficient and cost-effective network solutions, based on your particular needs.





## Like AT&T ACCUNET® T1.5 Service.

So if you want customer service that will support your service in a big way, call us. By comparison, everything else is just lip service.

*Digital solutions that meet your needs.  
Another AT&T advantage.*

For more information about ACCUNET Digital Transport Services, call your AT&T Account Executive or 1 800 247-1212, Ext. 439.



**AT&T**

The right choice.



## HP, Microsoft unite on Windows effort

*continued from page 9*

ed to embrace some of the object-oriented data handling capabilities built into NewWave.

Schofield pointed out that NewWave's simplest capabilities, such as its folder system, can currently support any MS-DOS-based application on the market.

For users to take advantage of the more complex capabilities in NewWave, such as compound document integration and task automation, the application would have to support NewWave application program interfaces (API).

However, relatively few applications

today support NewWave. Microsoft's Excel spreadsheet and Lotus Development Corp.'s Amipro word processing software are two of the most important, Schofield said.

"In the past, the application developers had to write for the NewWave API," said Viktor Grabner, a technological specialist at Microsoft. "People didn't think it was worth it."

By merging NewWave features and Windows/OLE functions into applications, users can create compound documents consisting of formatted text files, spreadsheets, maps and diagrams.

Users can, for instance, set up a report as a compound document, embedding the appropriate applications into it. Because

the document is linked to the actual applications, the composite report is updated automatically as individual elements are updated.

In the upcoming version of NewWave, applications will be able to recognize and build compound documents with other OLE applications.

"We're evolving our product so that the developer only has to use one set of APIs," Schofield said.

HP is the latest vendor to join the OLE fold, according to Grabner, who pointed out that Lotus and WordPerfect, Inc. are also committed to supporting OLE.

Although the agreement between HP and Microsoft contributes to the short-term chances for interoperability in Win-

dows-based compound-document systems, the long-term view may be different.

Schofield emphasized that HP ultimately intends to back a standard proposed by the Object Management Group (OMG), while Grabner said Microsoft, also an OMG member, has not yet made a specific commitment to the set of specifications expected to be issued by OMG.

"Our objective is to have a single standard," Schofield said, pointing to the work of the Framingham, Mass.-based OMG as the source of the industry's object management architecture.

Although Microsoft joined the 100-member OMG in March, it's not yet clear whether it will back future standards from group. **Z**

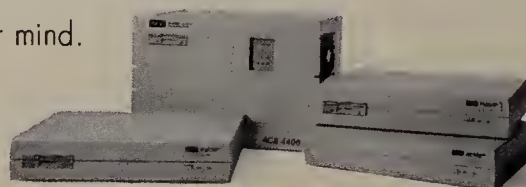
### Five a.m. and sixty below is no time for a bridge/router to fail.

come through every time. The reason? A remarkable MTBF of 15.6 years. That makes ACC standards-based, multiprotocol bridge/routers the most reliable in the industry. No one else even comes close. It's why networking managers in some of the most remote spots on earth rely on us for trouble-free internetworking. It's why you should, too. Your company's needs may not stretch quite so far as the Arctic, but whether you're connecting LANs around the corner or around the world, you'll do it more efficiently with ACC bridge/routers. And that's one big load off your mind.

Reliable, adaptable, cost-effective. ACC has you covered wherever you are.

For a free copy of our brochure, call today toll-free **1-800-444-7854**.

When field performance means everything, ACC bridge/routers



**ACC** Advanced Computer Communications  
The Smartest Investment In Internetworking

## Wellfleet signs AT&T to resell its gear

*continued from page 9*

possible conflict.

Wellfleet routers with frame relay interfaces are currently being used in customer trials and will be commercially available soon, said Gary Bowen, senior vice-president of marketing and field operations at the company.

The fact that Wellfleet is testing frame relay support with AT&T, MCI and US Sprint and has formed strategic relationships with all three should assure users that they can buy Wellfleet gear and feel confident that it will work in conjunction with the major new data services being offered by the largest carriers, Bowen added.

Terry Eger, Cisco's vice-president of North American sales and product marketing, called Wellfleet's string of carrier endorsements "nothing more than packaging by Wellfleet."

Cisco is also forming alliances with the major carriers but has stopped short of forming reseller agreements for the most part because the company prefers to sell direct, according to Eger. Selling through too many channels can hurt a vendor's profit margins, he said. **Z**

## Industry Briefs

*continued from page 9*

number of participants is known.

In January 1990, the carrier announced a five-year staff reduction program for Pacific Bell and Pacific Telesis personnel. Fewer than 3,000 jobs have been eliminated in those parts of the company since that time.

According to Sam Ginn, Pacific Telesis' chairman and chief executive officer, "It is clear to me we are not reducing as quickly as we must. We need to pick up the pace if we are to reach our goal."

### Mux maker buys stake in firm.

Telco Systems, Inc., a manufacturer of multiplexers for private and public networks, last week said it has acquired a minority stake in Magnalink Communications Corp., a Norwood, Mass., bridge maker.

Financial terms of the agreement were not released.

Under the agreement, the companies will jointly develop and market products. In fact, the two companies have already united to deliver Telco Systems' recently announced Route-3000 frame relay bridge. **Z**





Call 1-800-545-5773,  
extension 50, for  
your free copy of  
"How To Integrate  
3270 SNA, DEC and  
TCP/IP Networks."



Call 1-800-545-5773,  
extension 50, for  
your free copy of  
"How To Integrate  
3270 SNA, DEC and  
TCP/IP Networks."



# TELECOMMUNICATIONS

CARRIER SERVICES, CENTREX, CPE, WIRING SYSTEMS AND BYPASS

## Worth Noting

AT&T is now accepting orders for the 1992 edition of the AT&T Toll-Free 800 Directory, which it has issued every year since 1984. The directory costs \$14.95 plus tax, and shipping and handling. To order, call (800) 426-8686.

## Carrier Watch

**MCI Communications Corp.** recently announced three-year contracts totaling more than \$5.7 million with three large brokerage firms for domestic and international voice communications services.

The brokerages — Babcock Fulton Prebon U.S.A., Lasser Marshall, Inc., and Noonan, Astley and Pearce — will each use MCI's Vnet virtual network service to carry switched voice traffic.

The three firms are members of the Foreign Exchange and Currency Deposit Brokerage Association of America, Inc. (FECDBA). That group consists of eight brokerages that specialize in the trading of foreign currency.

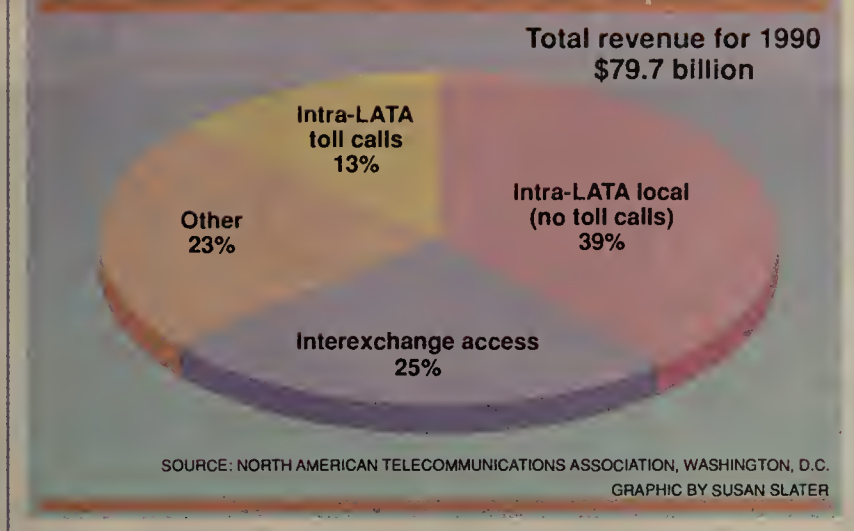
The three brokerages selected MCI after joining a FECDBA-sponsored subcommittee formed to evaluate long-distance services offered by major carriers.

In a separate development, MCI recently announced an initiative designed to help users set up voice information programs that use 800 and 900 services.

Under the MCI Voice Services Contractor Program, MCI's Information Resources Co. subsidiary will work with users and MCI account teams to develop interactive voice information programs.

The subsidiary will then subcontract the implementation and management of the programs to outside service bureaus and tele-promotions agencies. ■

## RBHC service revenue snapshot



## Pacific Bell petitions utility for reduction in toll rates

Seeks business rate decrease, basic service hike.

By Bob Wallace  
Senior Editor

SAN FRANCISCO — Pacific Bell recently asked the California Public Utilities Commission (CPUC) to reduce toll rates by 30% within the state's 10 local access and transport areas and to increase rates for basic service over a three-year period.

The proposed toll-rate cuts, which were necessitated by increased competition, could come as early as next month. Basic service increases, however, may not take effect until May 1992.

"Many of our current rates were established when there was little competition for telephone services," said Bruce Jamison, Pacific Bell's assistant vice-president of regulatory proceedings.

Under the proposal, rates for Measured Toll Service calls would drop an average of 30%, rates for coin calls would fall 14%, rates for credit card calls would drop 7% and rates for operator-assisted calls would drop 2%.

Pacific Bell also proposed three volume discount plans for businesses.

With the Automatic Plan, Pacific Bell would discount toll and calling card volume by more than \$15 a month, a 20% reduction.

For users that pay a \$5.50 monthly service charge, Discount Plan Alpha would provide toll and calling card discounts of 25% for total usage of up to \$700 and 40% for volume over \$700.

For users that pay a \$25 monthly charge, Discount Plan Beta would offer users toll and calling card discounts of 25% for usage of up to \$700, 40% for volume between \$700 and \$1,200, 45% for usage between \$1,200 and \$5,000, and 50% for volume more than \$5,000.

Customers could aggregate

usage from multiple locations to increase their discount under those plans.

Pacific Bell would waive installation charges for one of the new discount plans during a 150-day sign-up period. Businesses that do not change their current discount plan would be placed on the Automatic Plan.

In exchange for these new rates and discounts, Pacific Bell has proposed increases for basic exchange services over three years.

Measured Lines or Basic Trunks, which currently cost \$8.35 a month, would increase to \$10.90 a month and remain frozen for three years. Assured Trunks, which now cost \$12.25 a month, would increase to \$12.70 a month and likewise remain in effect for three years.

Installation for Measured Lines, which now costs \$70.75, would cost \$92 in the first year and \$103 in the second and third years. Installation for Basic Trunks would remain the same. Installation for Assured Trunks, which currently costs \$70.75, would cost \$83 in each of the next three years.

The \$8.35 measured segment of the Foreign Exchange (FX) charge would cost \$10.90 in each of the next three years. The \$11.25 incremental segment of the FX line charge would rise to \$16.85 in the first year, to \$22.45 in the second year and to \$26 in the third.

The Local Measured Usage Rate for the initial minute would increase from four cents to five cents, a rate it would remain at for the next three years. The charge for each additional minute would increase from one cent to two cents for the same period. ■

## AT&T points toward collusion in MFJ ban

Carrier accuses RBHCs, Justice Dept. of trying to reduce its influence, manipulate proceedings.

By Anita Taff  
Washington Bureau Chief

WASHINGTON, D.C. — AT&T is accusing the Department of Justice and the regional Bell holding companies of trying to shut out the long-distance carrier from decisions about the future of the Modified Final Judgment.

The dispute centers on an effort by the RBHCs to get permission to carry call signaling information on an interexchange basis. US West, Inc., for example, has asked for permission to consolidate signaling traffic for its 27 local access and transport areas at six signal transfer points (STP).

The Department of Justice supports the RBHCs' request to carry signaling on an inter-LATA basis to centralized STPs in their service areas. AT&T opposes that request.

With this case, the Justice Department has raised the political stakes in the battle over the future of the Modified Final Judgment and set up the potential for a major showdown that could open the way for the ultimate removal of the mandate's business restrictions.

The Modified Final Judgment currently bars the RBHCs from manufacturing equipment and offering information and long-distance services.

"The RBHCs and [the Department of Justice] have seized upon this [case] to seek a wholesale re-

The Justice Department has raised the political stakes in the battle over the MFJ.

▲▲▲

vision of the parties' rights and obligations under the [Modified Final Judgment]," AT&T stated in its brief. "They are seeking to use this court to pursue agendas that have nothing to do with the issues that are nominally raised."

Although this case, which has been winding through the court system for two years, focuses on the question of interexchange

(continued on page 18)

## WASHINGTON UPDATE

BY ANITA TAFF

### ATT asks FCC for Tariff 12 filing extension.

AT&T recently asked the Federal Communications Commission to extend the cutoff date for newly filed Tariff 12 deals containing 800 service from Aug. 1 to Aug. 8 so that 15 deals filed during that period can be approved.

The carrier filed a waiver request asking for the extension after the FCC issued an order this month banning 800 services from new Tariff 12 deals. The agency barred use of 800 in Tariff 12 contracts on Aug. 1 because of AT&T's market dominance. The carrier has 80% of the 800 service market, and customers cannot switch to other carriers' services without giving up their 800 numbers.

Although the FCC barred new Tariff 12 deals from containing 800 service, it decided to grandfather the existing 92 deals to avoid disrupting users' networks. AT&T claimed that it is just as disruptive to abruptly cut off newly filed deals and urged the FCC to exempt the 15 deals filed after the Aug. 1 date.

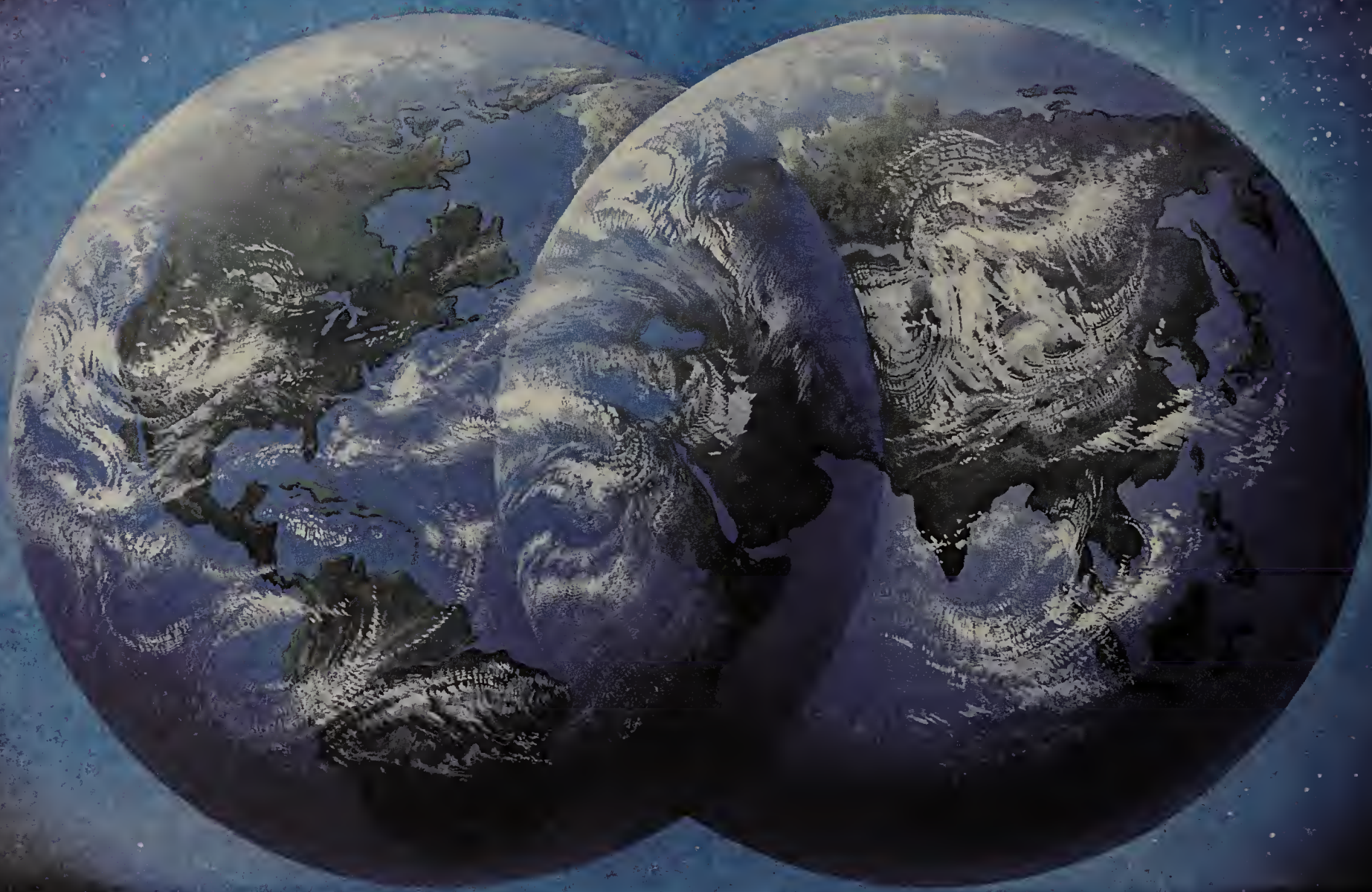
"The planning, design, procurement and negotiation of each [Tariff 12] option is a time-consuming, labor-intensive and expensive process, often extending over a period of a year or more and costing hundreds and thousands of dollars," AT&T said in its filing.

"Denial of a waiver would deprive customers of services they want or result in substantial delay and additional expense if customers attempt to redesign their networks to exclude inbound calling," the carrier stated. ■



# Announcing the merger of Gandalf & Infotron

## When Two Forces Merge...



## ...The Result is Powerful Solutions

**LAN...WAN. And beyond.**

**Gandalf delivers you a *total* enterprise networking capability.**

The worlds of LAN and WAN are now being united into a single, powerful entity, thanks to Gandalf's recent merger with Infotron Systems.

What it means to you and your world is complete access to a wide range of quality enterprise networking solutions and products. All backed by the combined resources and expertise of two of the most respected names in sophisticated local area networking and high-speed, high-volume wide area networking.

Combine Gandalf's proven ability to integrate a variety of LAN/WAN devices into a single cohesive network and Infotron's global networking experience. The result: cost-effective local and wide area interconnectivity solutions that can protect your current investment while keeping your options open to tomorrow's networking needs.

Call today for more information about the new Gandalf's powerful solutions in open systems networking, worldwide. US: 1-800-GANDALF; Canada: 1-613-723-6500.

COME SEE US AT TELECOM '91

**TELECOM**

BOOTH NO. 4.333

***gandalf***  
Open Networks  
for Open Minds



# GSA chief targets FTS 2000 billing

By Ellen Messmer  
Washington Correspondent

WASHINGTON, D.C. — In his first public appearance as the General Services Administration's new point man for the Federal Telecommunications System 2000, Donald Scott came armed with good news about dedicated digital service price reductions.

Speaking at a recent federal computer conference, Scott announced that the GSA has negotiated \$1.9 million in private-line data service reductions with AT&T for fiscal-year 1992. Scott said the GSA hopes to soon unveil a price-cap agreement with AT&T and US Sprint Communications Co., the two FTS 2000 carriers, that would drive down prices even further.

Scott also announced that the five power utilities run by the Department of Energy will not be forced to migrate their microwave networks to FTS 2000. The decision evoked cheers from the electric power administrators who last May had opposed the GSA order to move to FTS 2000 by Sept. 30.

Scott, the newly appointed associate administrator for FTS 2000, said the government's poor billing system and the high prices charged by AT&T and US Sprint were on his priority list in his new job as GSA overseer of FTS 2000.

Recalling his earlier job as telecommunications director at the Energy Department, Scott said, "In my user role, I was constantly critical of billing." The current FTS 2000 billing system is even worse than the old FTS system, he added.

The contentious pricing issue has been heightened by a recent General Accounting Office (GAO) report asserting that the government is paying \$148 million more than it should for services in the 1991 and 1992 fiscal years because AT&T and US Sprint have not dropped their prices to commercially available rates as called for in the FTS 2000 contract ("GAO finds FTS 2000 services overpriced," *NW*, Sept. 23).

Scott said the GSA is currently analyzing the report and could not offer a definitive comment at the time. However, he acknowledged that prices for voice and data services are still too high.

According to Scott, the GSA is trying to determine whether FTS 2000 services are in fact intrinsically different from publicly available offerings and what value, if any, should be attached.

"There's some belief that FTS 2000 offers services you will not

get if you go by a straight tariffed item, Scott said. US Sprint, for example, has asserted that network management services available under FTS 2000 make the network different from commercial services.

Efforts to drive down data prices, in particular, will grow increasingly important to the government over time. Scott said the

cutover of data services has only recently begun at most agencies.

"Presently, 87% of FTS 2000 is a switched voice service," he said. The network currently carries about two billion minutes of switched voice traffic per year, a total that is expected to increase by 50% in 1992.

"But data is expected to grow," Scott emphasized. "Be-

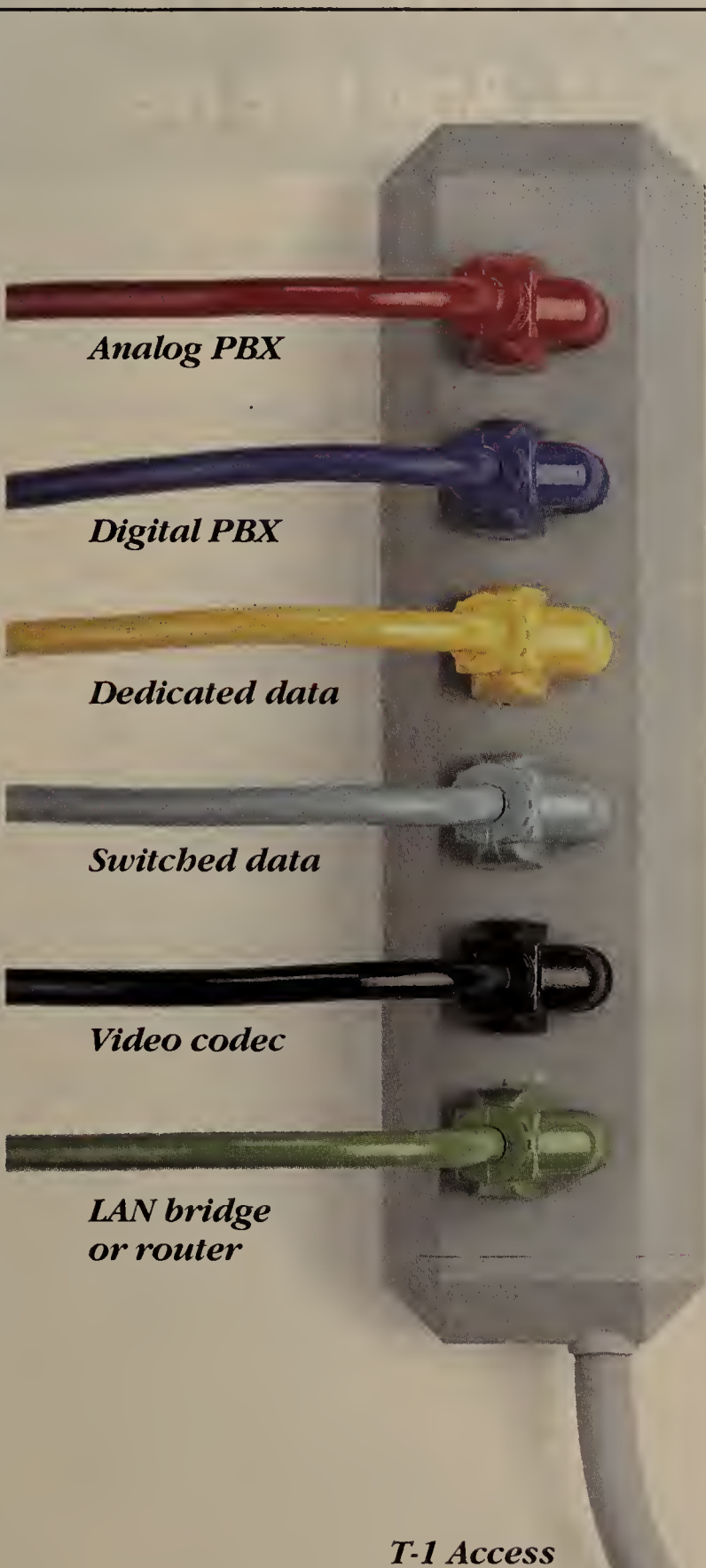
fore the contract ends, data services will be at least the size of voice services."

Scott breezed through his first speaking engagement with ease, but a tough road lies ahead with Congress, which has taken GSA to task for failing to maintain the proper 60-40 split between AT&T and US Sprint in FTS 2000 revenues. AT&T, entitled to 60% of

the contract, is currently picking up only about 40%.

In what some government officials privately viewed as a desperate attempt to raise traffic across the AT&T FTS 2000 network, the GSA last May ordered four agencies previously exempt from FTS 2000 mandatory use to migrate to the net by Sept. 30.

(continued on page 18)



## Plug into the power of integrated access.

Dowty Communications brings you the power of integrated access. With the new Dowty DCP9506 T-1 Network Access Multiplexer, you can combine switched data lines, dedicated data lines, switched voice lines and dedicated voice lines over a single T-1 local loop and access a diverse combination of carrier-provided services including AT&T's new ASDS, MCI's Digital Gateway and US Sprint's Integrated TAP services.

The versatile DCP9506 lets you choose from a long list of configuration options including built-in switched 56 TIUs, a built-in T-1 ESF CSU, two- and four-wire PCM and ADPCM voice channels, DS1 and DS0 interfaces and RS232, V.35 and RS422 data interfaces. All this in a package that grows to fit up to thirty channels in only 5.25" of rack space.

For more information on Dowty Integrated Access and on our worldwide support team, call 800-227-3134 or write Dowty Communications, 9020 Junction Drive, Annapolis Junction, Maryland 20701.

Fractional T-1

DDS

SDM/SRDM

Switched 56

Switched Voice



## Dowty Communications

Formerly CASE/Datatel

Circle Reader Service #109



# Introducing the next generation of UNIX servers. And the next. And the next.

*Everyone knows how fast technology is advancing, but this verges on the extreme:*

*Introducing the SPARCserver™ 600MP Series.*

*Today, they are the fastest, most expandable servers in Sun's history of fast, expandable servers. Tomorrow—literally—you can transform them from two-processor servers to four-processor servers.*

*And then, just when you've had time to catch your breath, you can step up their capabilities again with the soon-to-be-released Solaris™ 2.0 system software (based on UNIX® System V Release 4).*

*Each new SPARCserver system can be equipped with up to four processors for 90.3 SPEC throughput. That kind of blistering speed is just the ticket for faster file service, or blazing through the corporate databases (like Informix®, Ingres™, Oracle®, or Sybase®).*

*Unlike most multiprocessor servers—which force you to add entire system boards just to add CPUs—you can upgrade a SPARCserver simply by plugging in a small SPARC® module. It's faster, easier, and far cheaper.*

*And that's just one way to tailor these servers to your needs. A broad choice of memory, storage, and expansion options means you won't pay for more than you want. Or get less than you need.*

*Besides running the 3600 applications written for the Sun platform, our new SPARCservers will upgrade easily to Solaris 2.0—a symmetric multiprocessing environment. And it'll be just as easy to upgrade to the next generation of SPARC chip when it comes along—just plug in a new SPARC module.*

*So now that server technology has taken three steps forward, perhaps you should take a step toward the phone. Just call us at (800) 426-5321 ext. 300, and we'll rush you more information about the new SPARCserver 600MP Series.*

*They're going fast. And faster. And soon, even faster.*







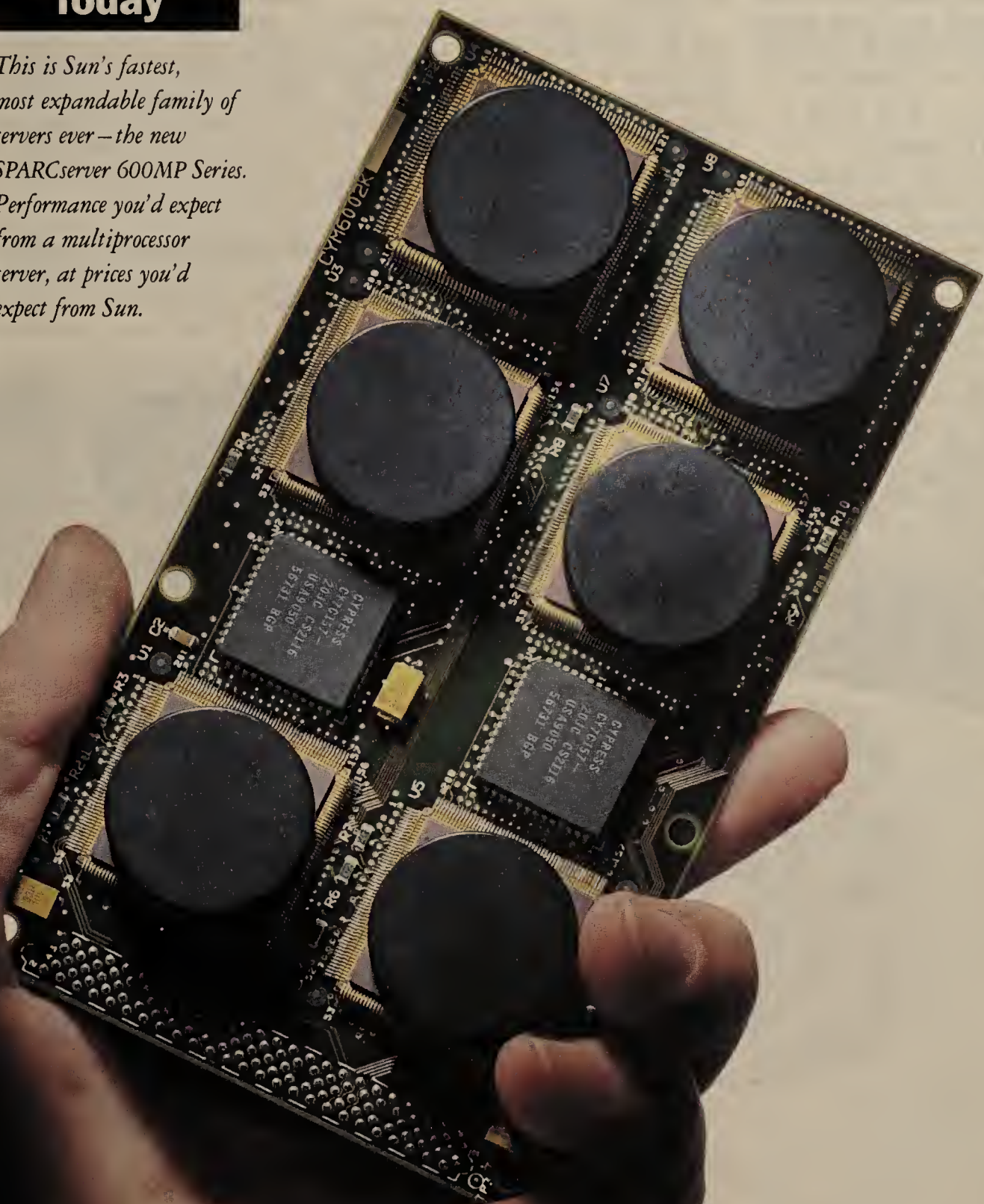
## Today

*This is Sun's fastest, most expandable family of servers ever — the new SPARCserver 600MP Series. Performance you'd expect from a multiprocessor server, at prices you'd expect from Sun.*

## Tomorrow

*For heavier workloads and more users, plug in this SPARC module and you've upgraded from two CPUs to four.*

*Because you don't buy an entire system board, you don't spend a fortune.*



## Soon

*The next generation of UNIX servers will yield even more powerful capabilities with the arrival of the next generation of client-server system software.\**





## AT&T points to collusion in ban

*continued from page 13*

signaling, the Justice Department has taken a legal approach that could reduce AT&T's influence on this issue as well as the core Modified Final Judgment business restrictions.

### No preferential treatment

In a brief filed in August, the Justice Department sought to realign AT&T's status in cases involving modifications of the Modified Final Judgment. The agency reasoned that since most of the order's restrictions that applied to AT&T have expired, the long-distance carrier has no

greater stake in the outcome of future proceedings than any other firm. Therefore, AT&T's opinion on proposed changes should be accorded no more weight than other parties.

This is important because the RBHCs and the Department of Justice both support lifting the bans. AT&T opposes lifting the bans on manufacturing and long distance, while it has been neutral on the information services ban.

If AT&T is the only party that opposes changes in the Modified Final Judgment but is relegated to lower legal status, then the court that oversees the mandate will have to use a more lenient standard in deciding whether to lift the bans.

U.S. District Court Judge Harold Greene

was forced to use that less strict legal standard in reviewing the ban on information services and decided that he would have to lift it. However, he placed a stay on the decision until all appeals are exhausted.

Greene has reviewed and denied the RBHCs' request for consolidated signaling. They appealed that decision, saying it will be prohibitively expensive to locate STPs in every LATA. US West said it would cost an additional \$60 million annually to install and \$6 million annually to maintain STPs in each LATA.

### Protesting possible exclusion

In its brief filed recently with the U.S. Court of Appeals for the District of Columbia, AT&T lashed out at the Justice Depart-

ment, not only for trying to ease the long-distance restriction enough to allow interexchange signaling, but also for attempting to shut AT&T out of the case.

"[The Department of Justice] now claims — for the first time in ten years since the [Modified Final Judgment's] entry — that AT&T has no legal or equitable interest in the maintenance and enforcement of the RBHCs' obligations under the [Modified Final Judgment]," AT&T said in its brief.

The carrier also said that since the RBHCs and the Department of Justice had thus far been unsuccessful at lifting the business restrictions by showing that the local carriers will not act anticompetitively in forbidden markets, they are now trying to redo the Modified Final Judgment.

"[The Justice Department's] challenges to AT&T's standing are simply attempts to do indirectly what the RBHCs and [the department] have been unable to do directly: avoid the settled antitrust principles that are the basis for the [Modified Final Judgment]," AT&T stated.

The case is scheduled for oral arguments on Jan. 21, 1992, and the appeals court could issue a decision anytime thereafter. □

## GSA chief targets FTS 2000 billing

*continued from page 15*

The agencies, all assigned to AT&T, were the Energy Department, the Federal Aviation Administration (FAA), the Tennessee Valley Authority (TVA) and the National Aeronautics and Space Administration.

The GSA's order placed the microwave nets of the Energy Department's five power administrations in jeopardy and forced negotiations for the FAA's Leased Interfacility National Communications System (LINCS), the air traffic control replacement contract, to be suspended.

Scott said the GSA had decided that the Energy Department's microwave networks should not be forced to transition to FTS 2000. "Some of those services are beyond what FTS 2000 could provide," he said.

Roger Seifert, deputy administrator at Bonneville Power Co., one of the government-run power suppliers, said the GSA granted Bonneville's microwave system a five-year waiver. But now that the new restrictions are in place, Bonneville is not allowed to purchase digital equipment without GSA approval. In addition, purchases of other equipment valued at more than \$2.5 million must be approved by the GSA.

The GSA and the FAA recently reached an understanding on the air traffic control system, allowing the FAA to proceed with the LINCS contract, expected to be awarded early next year.

Scott said discussions with NASA, the TVA and the FAA are continuing and the transition to FTS 2000 has not been resolved. "Neither the agencies nor the GSA has worked well," Scott said. "It's difficult when people are distrustful of the GSA."

The GSA, in fact, is back in the same tough position of trying to come up with more network traffic for AT&T.

In a House Government Operations Committee hearing last spring, GSA Administrator Richard Austin vowed that the GSA would achieve the correct 60-40 balance in revenues by Oct. 1. Members of Congress are likely to ask the GSA how it is faring on the issue soon. □



## Some vendor's maintenance coverage area for VSAT services is full of holes.

Which means that if your business locations are in one of the holes, you have to wait for service.

AT&T Tridom won't make you wait. All maintenance services cover the entire continental United States with a four hour mean time to arrive (MTTA). No exceptions. Plus, an optional service provides a two hour MTTA.

AT&T Tridom has more trained field service technicians than any other vendor. And they are 100 percent AT&T employees. No third parties. No finger-pointing.

At AT&T Tridom, our service is there when and where you need it, leaving other vendors simply...full of holes.

*Service —  
Another AT&T Advantage.*

For more information, contact your local AT&T account executive, or call (800) 346-1174 extension 317.



Circle Reader Service #120



# DATA COMMUNICATIONS

PRODUCTS, SERVICES, ARCHITECTURES, STANDARDS AND NETWORK MANAGEMENT

## Worth Noting

**A**dd this to the many miracles of frame relay: Maggie Parkinson and Jeff Paine, public relations managers at StrataCom, Inc. and Cisco Systems, Inc., respectively, were recently engaged to be married. Parkinson said frame relay is responsible for the engagement because the two met last year when their companies made a joint frame relay announcement.

## Data Packets

**BBN Communications Corp.** last week announced the availability of a frame relay data terminal equipment interface for its high-end T/300 Packet Switching Node (PSN).

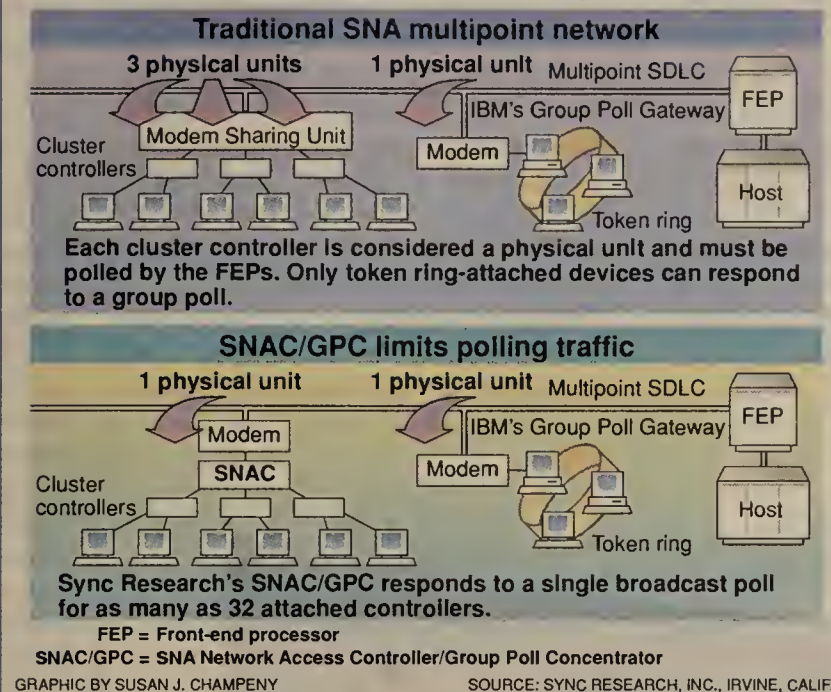
BBN, based in Cambridge, Mass., also added other features to the switch, including a new line card, networkwide congestion avoidance, power-on servicing and remote diagnostic capability. The add-ons are designed to provide high throughput, reliability and network availability for packet-switching applications, BBN said.

The frame relay interface is said to lower the operating cost and increase the operating speeds of the T/300 PSN. Frame relay lets a user employ a single T-1 line rather than the multiple trunks required for lower speed traffic, thereby reducing the number of interfaces required and cutting costs, according to BBN.

The new line card supports host and trunk speeds up to 2M bit/sec.

Networkwide congestion avoidance is said to optimize use of a network's resources during periods of heavy traffic  
(continued on page 20)

## Sync Research gets polling down pat



## Sync Research device cuts SNA/SDLC polling traffic

SNAC/GPC helps users improve net performance.

By Maureen Molloy,  
Staff Writer

IRVINE, Calif. — Sync Research, Inc. recently announced a device that enables users with large SNA/SDLC networks to reduce polling overhead and traffic congestion between host front-end processors and remote 3270 cluster controllers.

The SNA Network Access Controller/Group Poll Concentrator (SNAC/GPC) resides at remote sites and concentrates traffic from multiple cluster controllers onto a single Synchronous Data Link Control point-to-point or multipoint trunk.

As a result, it reduces the amount of SDLC and polling traffic to remote controllers and improves overall performance.

The SNAC/GPC mimics the function of IBM's Group Poll Gateway, a feature on Token-Ring Networks that enables a Personal System/2 token-ring gateway to respond to a host poll on behalf of all devices on the net. SNAC/GPC was unveiled at the recent 1991 TCA Annual Conference in San Diego.

"We've taken what IBM has done for SNA devices on token rings and brought the same functionality to users who haven't yet brought their SNA devices onto token-ring LANs," said Gregory Toussaint, Sync Research's vice-president of marketing and international sales.

The SNAC/GPC is the second product introduced by Sync Research to aid users looking to blend Systems Network Architecture networks with their multi-protocol backbone network.

The company's first product, the Sync Network Access Control-

ler/Token Ring Converter (SNAC/TRC) lets users attach cluster controllers to token-ring local-area networks. The SNAC/TRC connects as many as 32 controllers to a token ring, thus eliminating the need for wide-area SDLC lines.

The company's newest product is a gateway polling device aimed at the large installed base of SNA devices that are not LAN-attached, such as cluster controllers linked to SDLC lines. The SNAC/GPC concentrates traffic from multiple SDLC controllers at one site into a single SDLC point-to-point or multipoint trunk (see graphic, this page).

To the front end, the SNAC/GPC looks like a single physical unit. As such, it can respond to a single broadcast poll from the front end on behalf of as many as 32 attached controllers.

Previously, each controller at a site required a separate poll from the host.

The group poll function reduces front-end processing overhead associated with specific poll procedures and decreases traffic, thereby improving performance.

The SNAC/GPC will also allow users to consolidate the parallel SDLC lines currently required to accommodate the polling overhead inherent in SDLC networks. According to Sync Research, users sometimes split cluster controllers across two SDLC lines to improve polling response times.

The SNAC/GPC and attached controllers are all fully supported under NetView.

Pricing for the SNAC/GPC has not been set. The company will begin shipping the product to beta customers by year end. □

## AT&T charts course for BNS-1000 switch

Company says it will continue to support Datakit users, issue maintenance releases for its ISN.

By Jim Duffy  
Senior Editor

MORRISTOWN, N.J. — With the recent introduction of its BNS-1000 Fast Packet Switch, AT&T has unveiled its blueprint for a next-generation data switch that can outperform its existing products as well as provide support for fast packet switching and frame relay services.

AT&T officials last week said they will continue to support the installed base of Datakit Virtual Circuit Switch users for at least two software releases and issue maintenance releases for its Information Systems Network (ISN).

However, officials stressed that the future of AT&T's data networking lies with the BNS-1000, a high-speed packet switch that sets up virtual circuits for data transmission.

"We're reshaping the product direction," said Bill Regli, AT&T Network Systems product manager and director of data networking. "We will support Datakit for two to three releases at least. It depends on market demand and what the installed base requires."

AT&T announced the new switch as part of its BNS-1000 Broadband Networking Family, a line of local-area network interconnection devices that supports asynchronous and frame relay connections ("AT&T rolls out fast packet switch," Briefs, NW, Sept. 30).

### Product positioning

The BNS-1000 Fast Packet Switch is a customer premises version of AT&T's BNS-2000 broadband switch, which is targeted at carriers and public network-based services and applications.

The BNS-1000 is positioned as a backbone device that enables multiplexers and LAN inter-networking devices such as bridges and routers to pass data onto the backbone.

The device supports asynchronous and frame relay communications interfaces and provides bandwidth-on-demand capabilities, hardware redundancy and alternate routing features.

The new offering has an 8M bit/sec backplane and supports  
(continued on page 21)

## Future of Gandalf muxes rides on bus architecture

By Jim Duffy  
Senior Editor

OTTAWA — Gandalf Canada, Ltd. is banking on a new bus architecture to position its recently announced Infotron 2000 line of multiplexers as a viable transport mechanism for a variety of applications.

Gandalf has patented its so-called Quic Bus architecture, which is said to implement cell relay and circuit switching on the same platform to integrate voice, data, imaging, video and local-area network traffic.

"It provides the right transport and bandwidth allocation for any application you can throw at it," said Bob Barron, director of marketing for Gandalf's Infotron products operation in Cherry Hill, N.J.

Quic Bus uses 18 independent data buses to provide non-blocked, full-duplex throughput of 409.6M bit/sec, Gandalf said. Quic Bus can also support as

many as eight T-3 or E-3 trunks, the company said.

Quic Bus allows for future implementation of a combined circuit and proprietary cell relay switching fabric, according to the firm. Gandalf is specifying 16-byte cells instead of the 53-byte cells defined for the Asynchronous Transfer Mode standard.

Frame relay, Synchronous Data Link Control or X.25 frames are segmented and tagged as they enter the network. They are then reconstructed at destination points instead of at intervening nodes to optimize efficiency and throughput, Gandalf said.

The Infotron 2000 family consists of branch, regional and central multiplexers ("Gandalf airs high-capacity T-1 mux line," NW, Sept. 16).

The Infotron 2120 multimedia branch hub, priced between \$5,000 and \$11,000, is designed to bring voice, data, video and  
(continued on page 21)



# McDATA unveils 3172-compliant device to link Ethernets to host

Firm also ushers in new HSSI channel extender for T-3 lines.

By Paul Desmond  
Senior Editor

BLOOMFIELD, Colo. — McDATA Corp. last week introduced what it claims is the first IBM 3172 Interconnect Controller-compatible device along with a new product that supports IBM mainframe channel extension over T-3-based links.

McDATA's new LinkMaster 6100 Network Gateway-Server is compatible with

host software written for use with IBM's 3172, which connects Ethernet local-area networks to mainframe channels and supports T-1 mainframe channel-to-channel connections.

The new 6100 combines the functions of McDATA's existing LinkMaster 6100E Ethernet-to-mainframe gateway and the remote channel-to-channel features of the LinkMaster 6100C.

McDATA has added a 3172 device driver that lets mainframe applications written for the 3172 work with the 6100, said Brian Witt, group product manager for system products at the company.

Additionally, the 6100 runs terminal emulation software for Ethernet-attached devices, thus offloading that task from a host, Witt said. The product supports Open Systems Interconnection, Transmission Control Protocol/Internet Protocol Telnet and Digital Equipment Corp.'s Local Area Transport protocols to give users on OSI, TCP/IP or DEC's DECnet networks access to IBM host applications.

The 6100 supports as many as six Ethernets and can attach either to a host channel or to a front-end processor as a down-

stream token-ring node. IBM's 3172 can only be channel-attached to a host.

IBM has announced Ethernet adapters for its front-end processors, but they won't be generally available until the third quarter of 1992. The 6100 will be available in the fourth quarter of this year.

With the 6100, users can send print jobs from a Systems Network Architecture host to Ethernet-attached printers, which are often less expensive and more conveniently located than SNA printers, Witt said. The 3172 lets Ethernet users print only on SNA printers and requires additional host software for that function.

The 6100 can also connect two or more mainframes via remote channel-to-channel links, he said. That allows the product to automatically reroute data if one of the links fails and to provide load-balancing among the links for better bandwidth utilization. The 3172 supports only point-to-point mainframe channel connections, Witt said.

McDATA will demonstrate the 6100 at this week's INTEROP 91 Fall show in San Jose, Calif. The product ranges in price from \$12,360 to \$39,500, depending on configuration.

McDATA also last week announced the LinkMaster 5300 HSSI Channel Extension System, which uses the emerging industry standard High Speed Serial Interface (HSSI) to extend mainframe channels over T-3 lines to multiple types of remote devices. HSSI lets users define link speeds at any rate up to T-3, thus letting users configure remote mainframe peripherals, such as printers and tape drives, to communicate at their maximum speed, said Mary Coleman, vice-president of marketing for McDATA.

The 5300 includes an integral T-3 multiplexer from Digital Link Corp. that supports as many as four full-duplex T-3 links. The multiplexer enables users to attach other devices to the 5300, such as a private branch exchange, in order to fill a T-3 pipe.

McDATA plans to enhance the product at a later date to support Switched Multi-megabit Data Service, E-3 and Synchronous Optical Networks.

The 5300 is available now. A Model 1 configuration, with two channel extenders and two multiplexers, costs \$159,500. Model 2, with four channels extenders and four multiplexers, costs \$249,500. □



## Now If You Want To Run A 10 Base T Ethernet System, You'll Just Have To Spend Less.

### Introducing Du Pont's LAN ONE With 10BaseT. The Affordable Standards Conformant System.

Why spend up to four times more for LAN hardware that can handle 10BaseT Ethernet and even fiber optic Token Ring within one system?

DuPont's new LAN ONE 10BaseT System will do it for much less. In about half the space.

Just 6½" high, the LAN ONE Universal Concentrator cuts wiring closet space by nearly 50%. And when configured as a 100% twisted pair system, up to 60 Ethernet nodes can be interconnected on a single concentrator.

LAN ONE 10BaseT is also extremely versatile, thanks to "standards conformant" modules that interface with other "standards" hardware, giving you more choices when expanding your LAN.

And here's another cost-saving feature. Instead of separate concentrators for each protocol, LAN ONE runs Ethernet (using twisted pair, fiber optic or coax cabling) and fiber optic Token Ring (in both 4 and 16 Mb/s versions)

concurrently within a single Universal Concentrator.

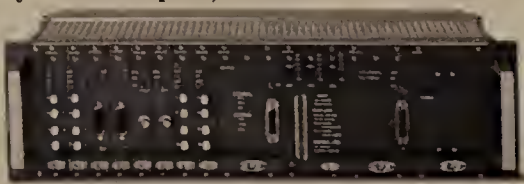
Equally important, DuPont LAN ONE hardware is designed for modularity. Our new products are always compatible with the old. Equipment enhancements can be made at minimum expense. And different LAN types can be added or dropped without making your concentrator obsolete.

To learn more about LAN ONE from DuPont, a leader in LAN systems since 1982, send for our free brochure. Just call 1-800-888-LAN1 or 1-919-481-5100.

Or write: DuPont Electronics, Electro-Optic Products,\* P.O. Box 13625, Research Triangle Park, NC 27709.

You can't buy more compact, versatile—or more

affordable—LAN hardware to run both 10BaseT Ethernet and Token Ring within a single system.



See us at INTEROP '91.



Circle Reader Service #110

**DuPont Electronics**  
Share the power of our resources.



## Data Packets

*continued from page 19*

by proactively preventing congestion from occurring.

Net availability is also enhanced by redundant hardware and power-on servicing built into the T/300 PSN.

The T/300 PSN will be available for shipment in December. Pricing begins at \$48,000.

**Hughes LAN Systems, Inc.** of Mountain View, Calif., last week announced frame relay support for its ProBridge 8133 Remote Ethernet Bridge. The bridge supports frame relay links ranging in speed from 19.2K to 2.048M bit/sec along with many of the Local Management Interface specifications.

The new frame relay software will be available in December. It can be purchased by existing ProBridge 8133 users as a \$500 software upgrade and will be offered at no charge to users under software maintenance contracts. □



## AT&T charts course for BNS-1000 switch

*continued from page 19*

up to 15,000 permanent virtual circuits. It switches up to 44K packet/sec. In addition, the BNS-1000 supports subrate, fractional T-1 and T-1 rates between four internal frame relay modules and attached routers.

By contrast, AT&T's older Datakit is a virtual circuit switch with an 8M bit/sec backplane that supports 3,500 simultaneous virtual circuits and switches over 44K packet/sec. The ISN is a packet-based virtual circuit switch with a 8.64M bit/sec backplane for terminal-to-host access and LAN bridging.

For ISN users, the BNS-1000 represents another alternative to the many products on the market, Regli said. "We're putting some additional features in the ISN as well as providing an alternative for the growth of ISN users."

The BNS-1000 may be just what the doctor ordered for ISN users who have reached their limits with the lower end switch. Although ISN users had not yet been briefed on AT&T's BNS-1000 product line and strategy, some said they were already looking at alternatives to the ISN for LAN internetworking.

"ISN is good for asynchronous communications, but we need higher speed links

for LAN-to-LAN networking," said Ray Capriolo, network analyst for chemical group information systems at American Cyanamid Co. in Wayne, N.J.

contemplating a move away from the ISN. "What's the next technology for the next five to 10 years?" Reimers asked. "We saw nothing happening on the ISN, and the

In addition to the BNS-1000 Fast Packet Switch, the BNS-1000 product line includes the LCS 200 Network Routers and LCS 100 Network Gateways.

Although AT&T already had an agreement with Cisco Systems, Inc. to resell its bridge/routers, the carrier established a similar arrangement with Wellfleet Communications, Inc. to resell Wellfleet routers as the LCS 200 line. AT&T Network Systems said it sees no sales channel conflict or conflict of interest in having relationships with two router rivals.

"There's a need for both routers in our product line from a marketing perspective," Regli said. "Users are asking for a specific router. We'll give them both alternatives." ■

**T**he BNS-1000 supports subrate, fractional T-1 and T-1 rates between four internal frame relay modules and attached routers.

▲▲▲

Fred Reimers, technical consultant for telecommunications at ICI Americas, Inc. in Wilmington, Del., said his company is

Datakit's too expensive. Maybe [the BNS-1000] is it. We're definitely going to find out about it."

## Mission-critical networking is a hot issue these days.

## Now BBN presents four ways to avoid getting burned.

## Future of muxes rides on architecture

*continued from page 19*

LAN networking to small branch offices.

In point-to-point mode, the Infotron 2120 functions as a fractional T-1 multiplexer that supports seven low-speed asynchronous/synchronous channels and three high-speed synchronous channels. The 2120 also supports automatic link redundancy and switched 56K bit/sec lines for backup. In addition, the 2120 can serve as a LAN bridge/router for token-ring and Ethernet networks, Gandalf said.

The 2120 aggregates traffic for transmission to the Infotron 2300 regional network concentrator, which, at \$14,000 to \$18,000, supports data transmission at up to T-1 and E-1 speeds. In the future, the 2120 will be able to communicate with the 2300 over frame relay links, according to the company.

The Infotron 2000 central site multiplexer, priced between \$50,000 and \$500,000, is a high-performance switch used to consolidate low- to high-speed traffic onto a single link.

The Infotron 2000 product line is said to have a fault-tolerant architecture with redundancy for all critical components, logic and power sources, as well as shared redundancy for other components. The Quic Bus, for example, uses independent data buses for each of its 18 slots for reliability and hot replacement of modules, Gandalf said.

The Infotron 2000 provides integrated management of the branch, region and central site physical networks from a single workstation, the company said.

The Infotron 2000 line is available now. The segmentation and tagging feature for frame relay, X.25 and SDLC frames will be available in the second half of 1992. The LAN bridge/router module for the 2120 and the frame relay links to the 2300 will be available in the second quarter of 1992. ■

Most vendors will tell you how easy networking is. But BBN knows – and you know – that building a mission-critical network may be the most complex job you ever undertake.

After 20-plus years of building and maintaining data networks worldwide, BBN has learned a lot about successful networking – and how to avoid getting burned.

### 1. Recognize the challenge of data.

Data networking is the fastest growing area of communications. And it's especially challenging with multiple DP vendors and compatibility issues. BBN is a specialist in data networks. We've built all kinds of mission-critical networks, from classic packet switching to SNA to internetworking.

### 2. Take care of your installed base.

Don't let a vendor dazzle you with next year's standards. While standards are important,

your business depends on the MIS systems you've already installed. That's why BBN supports a wide range of standard and vendor interfaces, such as async, bisync, X.25, SNA, TCP/IP, DECnet™, Novell IPX™, AppleTalk®, and emerging OSI standards.

### 3. Look at the services behind the network.

A network is more than a set of boxes. It's a solution that works for your business. BBN's network experts are among the most knowledgeable in the industry. By understanding your requirements first, we can design and deliver an end-to-end solution customized to your organization.

### 4. Don't underestimate the value of experience.

In networking, what you don't know could hurt you. That makes BBN's experience especially important. We built the first packet-switching network 20 years ago. Since then we've

built networks for many of the world's leading government and commercial organizations.

There's a lot more to consider in networking. That's why BBN has put together the "Networking Knowledge Series," a collection of interviews and articles from some of the leading experts in the communications industry. The series will give you valuable insights into the trends and issues that are shaping networking in the 1990s. To receive your free set, please call today.

And remember, BBN's experience could make the difference between a network that goes up on time, and one that goes up in smoke.

**FREE: Networking Knowledge Series**

**Receive all 7 issues!**

**CALL 617-873-2678**

All trademarks are the property of their respective companies.

**BBN Communications**  
A Division of Bolt Beranek and Newman Inc.



Networks Built on Experience



# MEET OUR MANAGEMENT TEAM

*"No two networks are alike. By manufacturing and developing the industry's broadest product line, we can tailor any network to our customers' needs."*

S. Robert Levine  
President & CEO



## Ethernet, Token Ring and FDDI

At Cabletron Systems, we recognize the integrated networks of today provide your company with the competitive advantage it needs tomorrow. In response to your needs we've developed the broadest product line of leading-edge technologies that fully integrate under Cabletron's powerful network management umbrella.

### **Intelligent Hubs**

Cabletron's Multi Media Access Center intelligent wiring hub series connects Ethernet, Token Ring and FDDI local and wide area networks together in a single chassis. Our other hub products include standalone devices for 10BASE-T and Token Ring smaller connectivity environments.

### **Management Platforms**

Remote LANVIEW®/Windows, the industry's first management software solution for SNMP

Ethernet and Token Ring networks, was the world's first network management software package to offer completely integrated worldwide desktop LAN/WAN management from a central control console.

And now we've brought network management to a new level with SPECTRUM,™ Cabletron's advanced management platform, that goes far beyond the current generation of management systems to provide a cohesive, powerful and flexible environment for managing multi-vendor networks.

**CABLETRON**  
systems inc.

The Complete Networking Solution

Corporate Headquarters

35 Industrial Way, Rochester, NH 03867-5005  
(603) 332-9400

### **Desktop Connectivity**

Of course there's more, including Cabletron's own Ethernet and Token Ring Desktop Network Interface (DNI®) adapter cards, the industry's first manageable adapter card solution; as well as our entire line of manageable 10BASE-T and Token Ring connectivity products.

It is easy to see why Cabletron has become the leader in network management technologies. That's why over 22,000 customer sites already use our products to connect more than 2 million network nodes. Use Cabletron's network management team to give your company the competitive edge it needs.

With more than 35 offices worldwide, there's a Cabletron location near you. Call us today at our headquarters for our product brochures or to arrange a live demonstration.

European Headquarters: Network House, Newbury Business Park, London Road, Newbury, Berkshire, England RG13 2PZ 011 44 635 580000

**See us at Interop Booth #2714**



# LOCAL NETWORKING

PC AND TERMINAL-TO-HOST LANS, GATEWAYS AND MICRO COMMUNICATIONS PRODUCTS

## Worth Noting

“With the upcoming networking shows this fall, one of the major themes that keeps popping up is network management applications. We’re finally going to see the fruits of all this architectural chitchat.”

**John Rymer**  
Senior consultant  
Patricia Seybold Office  
Computing Group  
Boston

## Netnotes

**Artel Communications Corp.** this week will unveil its new Galactica 1.0 multiport bridge at INTEROP '91 Fall in San Jose, Calif.

Unlike existing bridges, the Galactica 1.0 has a 1 G bit/sec bus that can bridge as many as 32 Ethernet local-area networks at full 10 M bit/sec speeds.

The bridge is a stand-alone device with a five-slot chassis that supports a Simple Network Management Protocol (SNMP)-based network management card and four additional Ethernet interface boards, each with eight bridge ports, for a total of 32 LANs supported by the bridge.

According to Artel, which is based in Hudson, Mass., the first release will only include Ethernet bridging modules. However, subsequent releases will include modules for Fiber Distributed Data Interface and token-ring bridging.

Pricing starts at \$18,500 for an eight-port system that includes net management software. The product will be available next month.

**InterCon Systems Corp.** this week will announce Dispatcher/SMTP for QuickMail at INTEROP '91 Fall. The offering is the first in a line of electronic messaging gateway products aimed at Apple Computer, Inc. Macintosh users.

(continued on page 25)

## Industry chiefs challenge rivals' latest developments

Leaders enter debate over OS/2 and Windows.

By Timothy O'Brien  
West Coast Bureau Chief

OPIO, France — More than 500 senior executives from vendor companies in the U.S., Europe and Asia gathered here recently to exchange ideas and discuss emerging technologies that will shape the future of office information systems.

Although there were discussions about object-oriented technology, multimedia and distribution issues, one of the main events at the European Technology Roundtable Exhibition (ETRE) conference was a showdown between two keynote presentations.

Industry giants Jim Cannavino, vice-president and general manager of IBM Personal Systems, and William Gates III, chairman and chief executive officer of Microsoft Corp., squared off in a battle over their respective desktop operating system environments — OS/2 and Windows.

Gates admitted he was surprised that Windows 3.0 had sold more than five million copies since its release 14 months ago. He said the rise of the graphical environment is spurring the next

wave of innovation in applications.

“During the next six months, the industry will go from having three of the top 10 DOS applications in a graphical environment to 10 of the top 10,” Gates said. “The message has gotten out to software developers.”

IBM's Cannavino began by reflecting back to the mid-1980s when Microsoft and IBM set a course to design a new operating system with advanced features such as protected memory, preempted multitasking, the ability to exploit the 32-bit architecture and a sophisticated file system.

“We were pretty confident then and we are confident now that OS/2 is the operating system to address those critical requirements,” Cannavino said.

He also pointed out that Microsoft's new operating system under development, Windows NT, is still off in the future, while OS/2 is available now.

However, Philippe Kahn, president and CEO of Borland International, Inc., wanted to offer his company's view. He said developments previous to 1980 are now irrelevant and that use of object-

(continued on page 24)

## Start-up catapults into mart with TCP/IP gateway

By Caryn Gillooly  
Senior Editor

READING, Mass. — Start-up Ipswitch, Inc. last week unveiled its first product, a gateway that enables Novell, Inc. NetWare users to connect to devices on TCP/IP-based networks.

The product — called CatIPult — differs from other gateways because it resides on a dedicated gateway server instead of vying for a portion of a NetWare server. In addition, it does not require a Transmission Control Protocol/Internet Protocol stack at each client station.

On the server side, this assures the local-area network administrator that the NetWare server won't crash as a result of a gateway problem. Also, the NetWare server will not be affected by gateway performance. On the client side, users don't waste memory with a full protocol stack.

CatIPult consists of software that resides on a server as well as

client workstations. The server portion consists of gateway functions and runs on a dedicated OS/2-based gateway server that translates between NetWare and TCP/IP protocols.

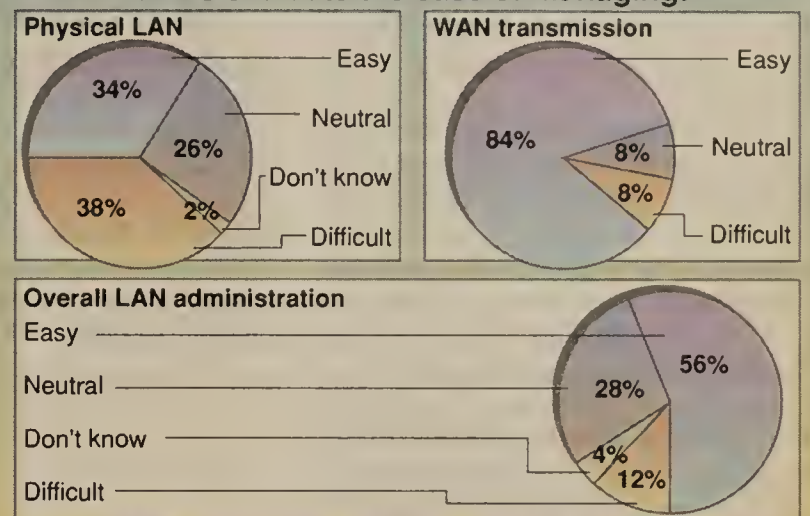
The software, which comes with an unlimited user license, will support 30 simultaneous TCP/IP connections and does not require vendor-specific network interface cards. It will run with any network interface card supported by Novell's NetWare Requester for OS/2.

The client portion of the software, which runs on any DOS-based NetWare workstation, is basically a suite of TCP/IP applications. The client code uses only 11 K bytes of workstation memory. It includes such applications as IBM 3270 and Digital Equipment Corp. VT terminal emulation, file transfer using the TCP/IP File Transfer Protocol, a CatIPult-specific distributed mail

(continued on page 25)

## Rating network manageability

Users evaluate the ease of managing:



Figures are based on respondents from 50 Fortune 1,000 companies.

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: FORRESTER RESEARCH, INC., CAMBRIDGE, MASS.

## Physical LAN mgmt. still posing problems

Network administrators say the task remains an arduous one despite technological advances.

By Caryn Gillooly  
Senior Editor

CAMBRIDGE, Mass. — Despite the ongoing release of more technologically advanced products for local-area network management, one of the oldest and most nagging problems is still physical LAN management — managing LAN connections such as wiring and adapter cards, analyzing LAN protocols and monitoring LAN devices.

According to a study by Forrester Research, Inc., 38% of 50 network administrators surveyed at Fortune 1,000 corporations rated physical aspects of the LAN as “bad” or difficult to manage (see graphic, this page). That figure contrasts sharply with the 8% who rate wide-area networks as difficult to manage.

Janet Hyland, director of network strategy research for Forrester, based here, offered some reasons why physical LAN management is such a chore.

“First, with all the wires and connectors, it's easy to get glitches,” she said. “Many wiring closets are still just a bunch of spaghetti, where a problem requires going in and crawling around on your hands and knees to find out what's wrong.”

Another reason, she said, is a lack of efficient tools. The current products address different types of physical LAN problems. There are hub managers that just manage hubs, monitors that watch network traffic and analyzers that simply capture protocol information as it passes.

Survey respondents agreed. “We have a hub manager, a LAN

monitor and several protocol analyzers,” said a representative from a metal products company cited in the study. “Even with all these products, we can't resolve some problems. Information from our management products doesn't agree; they even classify errors differently.”

The only products available today that can do all necessary monitoring and managing are tools such as Cabletron Systems, Inc.'s Spectrum and Network General Corp.'s Expert Sniffer, Hyland said. However, both carry a hefty price tag, with Spectrum costing more than \$100,000 and the Expert Sniffer starting at more than \$25,000.

The study also cited frequent adds, moves and changes, and mixed technologies — such as Ethernet and token ring — as some factors that contribute to physical management problems.

Besides expensive tools, another promising way to improve LAN management is to move to structured wiring systems anchored by LAN hubs.

According to the study, “while users with unstructured LANs have many problems, most smart hub users rated manageability of the physical LAN as “good.” Of the 50 respondents, 24% said smart hubs provided the biggest improvement to network management, second only to organizational changes and implementing standards.

“Smart hubs have made a difference,” Hyland said. “They are not the be-all and end-all for solving network problems, but they

(continued on page 24)



## Chiefs challenge rivals' developments

*continued from page 23*

oriented programs at the desktop level, client/server architectures and true 32-bit computing would define the next decade.

"The desktop will drive the rest of the industry," Kahn said. "We believe the customer wants to solve problems from the desktop."

But Larry Ellison, president and chief executive officer of Oracle Corp., disagreed with the concentration on the desktop.

"The industry is utterly obsessed with the desktop; it should be called client, client, client and sometimes server," Ellison said. "The focus in the nineties has to be a shift back to the server since no one has done anything to develop the server or the next-generation mainframe for a decade."

Ellison envisions a time in the near future where high-speed optical networks will support next generation of massively parallel mainframe servers built using personal computer components. These mainframes would run only one application, a program that manages shared data consisting of complex objects such as video, data and sound.

However, neither Ellison's pitch nor the desktop debate impressed Sandra Kurtzig, president and chief executive officer of ASK Computer Systems, Inc. ASK acquired

Ingres Corp. in December 1990 and now boasts one of the leading data bases in the industry to complement its line of business

here," Kurtzig said. "The technology is driving us rather than us driving it."

Conference presenters often spoke of

**"T**he industry is utterly obsessed with the desktop; it should be called client, client, client and sometimes server," Ellison said.

▲▲▲

application software.

"The real issue is where are the simple business applications that solve the problems of customers. That's what's missing

the four main applications that make up 70% of the current software market today. There are spreadsheets and word processing and word processing and spreadsheets.

In other words, Kurtzig said, the large software companies are selling general solutions and haven't got down to the real work of developing more specific business applications that take advantage of advances in client/server and graphical user interfaces.

Two technology sessions covering object-oriented data bases and multimedia received a tremendous amount of interest, indicating that many high-level executives wanted to catch up on the industry's latest developments. The small, up-and-coming, object-oriented data base vendors present, such as Objectivity, Inc. and Ontos, Inc., seemed pleased that both Kahn and Ellison indicated that this object-oriented technology would be the way of the future. ■

## Physical LAN mgmt. still posing problems

*continued from page 23*

add a significant incremental benefit for ease of manageability."

One of the reasons for this is that companies with hubs have more structured cabling systems, according to Hyland. These users have designed their networks with more thought and have avoided spaghetti-type wiring, she said.

Another reason is that hub vendors are putting more physical management capabilities into their products. "We see these disparate products combining into single products that will be more intelligent," Hyland said. "We think hub vendors will roll out management systems that will include protocol analysis and LAN monitoring tools."

Hyland pointed out that traditional LAN analysis vendors such as Network General will argue that these all-in-one products will not offer the advanced capabilities of products such as the Expert Sniffer. But they will offer a centralized management scheme that will include physical LAN management, something previously unavailable to the net administrator.

### Sound advice

In light of the current market, the study advises users to take two steps to manage the physical aspects of the LAN more easily. "Build bulletproof LANs," the study recommended. For mission-critical applications, the study suggests users spend extra money to build a solid LAN infrastructure, which includes professional wiring installation and high-quality net servers.

Second, the study suggests users carefully select smart hub vendors. Because the hub vendor's network management capabilities will be central to the LAN, it is important to choose a solid vendor with dependable products and a solid reputation for reliability and service. ■

**MORE POWER TO YOU WITH**

**ZENITH**  
data systems  
Groupe Bull

(386 and i486 are trademarks of Intel Corporation. Microsoft Windows, and LAN Manager are trademarks of Microsoft Corporation. NetWare is a registered trademark of Novell, Inc. Banyan and VINES are trademarks of Banyan Systems, Inc. SCO is a trademark of Santa Cruz Operations. ISC is a trademark of International Systems Corporation. UNIX is a registered trademark of American Telephone & Telegraph Company.

Copyright © 1991 Zenith Data Systems Corporation.

Circle Reader Service #122



## Netnotes

continued from page 23

Based on the Simple Mail Transfer Protocol (SMTP), Dispatcher/SMTP for QuickMail will link users on networks running CE Software's QuickMail with other SMTP-based electronic mail users, such as those on Unix, Digital Equipment Corp. VAX/VMS and IBM MVS systems. The product is software that resides on the QuickMail server.

InterCon, based in Herndon, Va., will also display the preliminary version of Dispatcher/X.400 for QuickMail, the next release in its E-mail product line, at the trade show.

Dispatcher/X.400 will serve as an

X.400 gateway, connecting QuickMail users to other E-mail users via X.400. Like the Dispatcher/SMTP for QuickMail, the X.400 product is software residing in the QuickMail server that converts proprietary E-mail formats into X.400 format.

Dispatcher/SMTP is available now at a cost of \$995 for an unlimited number of users. Dispatcher/X.400 is currently in beta test and is scheduled to be available next month. Pricing has not yet been established.

**Triticom** recently announced upgrades to its line of LANVision Traffic Monitor software, which includes EtherVision 2.1, TokenVision 2.1 and ArcVision 2.1 as well as its Argus/n LAN Workstation Moni-

tor for NetWare LANs software.

According to Triticom, based in Eden Prairie, Minn., the new versions of EtherVision and TokenVision now include filtering and alarms for each station on a local-area network. This lets an administrator select one net station, such as a particular troublesome node, for detailed monitoring.

The new TokenVision version also includes a real-time map of the ring topology, showing the actual physical ordering of the stations on the ring and automatically updating that map as stations are added or removed. The new ArcVision version now includes adapter- and network-specific diagnostic functions.

The new version of Triticom's NetWare monitoring software — Argus/n Version

1.4 — can report complete Novell, Inc. NetWare Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX) and Shell Driver statistics for any LAN workstation.

All new versions in the LANVision series are available now. TokenVision 2.1 costs \$495, while EtherVision 2.1 and ArcVision cost \$395 and \$295, respectively. Upgrades are free to existing LANVision customers. Argus/n 1.4 is available now in two versions. The basic version, priced at \$245, provides monitoring for as many as 250 workstations on a single NetWare LAN. Argus/n InterNetwork, priced at \$645, provides monitoring of up to five internetworked NetWare LAN segments with up to 250 stations per segment. **Z**



**NOW THE ZENITH DATA SYSTEMS DESKTOP PC LINE DOES MORE THAN EVER.**

On any desk, PC power tends to follow a predictable path. Upwards. That's why maximum expandability is the idea behind the Zenith Data Systems desktop PC line.

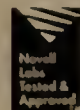
And our versatile new PC LAN products are choice examples. The Z-486/33ET LAN Server offers you a wide range of expansion options and comes ready to support all leading networking standards.\* Pair it with our Z-LS Diskless LAN Station for superior performance.

Or for expandability and advanced graphical computing right out of the box, choose our new Z-486SX/20E or Z-486/33E personal workstations with *The Seamless Solution* — pre-installed with Microsoft® Windows™ v. 3.0 plus a Microsoft mouse.

So connect with Zenith Data Systems. For more information and the name of your nearest Zenith Data Systems Medallion Reseller, call **1-800-523-9393** in North America.

**OUR NEW PC LAN SYSTEM.**

	Z-386SX/20	Z-486SX/20E	Z-486/33E	Z-486/33ET	Z-LS
Microprocessor	i386™SX - 20/10 MHz	i486™SX - 20 MHz	i486DX - 33 MHz	i486DX - 33 MHz	i386SX - 16 MHz
Co-Processor	Optional 80387SX	Weitek 4167 socket i486DX upgrade	Weitek 4167 socket	Weitek 4167 socket	Optional 80387SX
Memory (Std./Board Max.)	2MB/16MB	4MB/32MB	4MB/64MB	8MB/64MB	1MB/8MB
Expansion Slots	4 open 16-bit ISA	3 open 32-bit EISA	3 open 32-bit EISA	8 open 32-bit EISA	2 open 16-bit ISA
Hard Disk Drive	40MB or 80MB IDE	80MB or 200MB IDE	200MB or 400MB IDE	340MB half height SCSI; 6 open half-height bays	Diskless, 40MB IDE optional
Ports	2 serial, 1 parallel	2 serial, 1 parallel	2 serial, 1 parallel	2 serial, 2 parallel, 1 mouse	2 serial, 1 parallel
Disk Drive Controller	Combined IDE connector/floppy controller	Combined IDE connector/floppy controller	Combined IDE connector/SCSI/floppy controller	EISA bus master SCSI mass host adapter	IDE connector/floppy controller
Video	16-bit VGA card	16-bit VGA card	TIGA/VGA	16-bit VGA card	16-bit VGA on board
LAN Features				Optional RAID 5 disk array software	Dual level ROM-based password protection



\* The Z-486/33ET has been tested for compatibility with Novell NetWare® and Microsoft LAN Manager™. The Z-486/33ET has been submitted for testing and compatibility with Banyan® VINES™ and SCO™ and ISC™ UNIX®.

**POWER FROM A NEW PERSPECTIVE. YOURS.**



## Gateway catapults start-up into mart

continued from page 23

system, Telnet and other utilities.

There are two primary advantages to having the gateway run on a dedicated server and not on the NetWare server. First, it will not take up valuable processing power on the NetWare server by forcing it to handle multiple gateway sessions.

"I personally am not comfortable putting that [kind of product] on a NetWare server," said Alan Medsker, manager of computer and network support at Viewlogic Systems, Inc., where CatIPult was tested extensively before its release. "And since it runs on a separate box, it has the capacity to handle quite a bit more traffic."

Second, the product will not crash the server if there is a problem with the software. "With gateways, in general, you have to be careful how much traffic you push through them," Medsker said. "Not crashing is a milestone for this type of product," so having it reside off the server is a definite plus.

According to Roger Greene, president and founder of Ipswitch, based here, another differentiating factor between CatIPult and competitive products is CatIPult's "simultaneous user connectivity." This means that the customer need only buy one site license to load the software onto all client workstations. However, only 30 sessions are supported concurrently.

"With this setup, anybody on the LAN can connect to the gateway," Greene said. In addition, the software lets any TCP/IP host transfer a file to the NetWare server for future access to any client on the LAN.


Medsker agreed that this is another advantage. "It doesn't matter if 500 people want to use [the gateway]," he said. "You can distribute the software to all 500, but only 30 will be able to use it at one time."

He also pointed out that this setup results in a big difference in price. CatIPult costs \$2,975 for the 30-user license, while Novell's TCP/IP translation NetWare Loadable Module costs about \$200 per client workstation — or approximately \$6,000 for 30 users, regardless of how often those users connect to the gateway.

Medsker noted one other advantage to CatIPult that competing products do not offer: All CatIPult users can share one IP address, so the administrator does not have to allocate a different address for each user. Greene said the gateway can distribute messages to the appropriate clients once they arrive at the IP address.

CatIPult is available now. It runs over any Ethernet, token-ring, Arcnet or broadband net running NetWare 2.X or 3.X. **Z**





Hundreds of offices. One communication network.

New York. London. Paris. Frankfurt. Can any one communication company cover that much ground? If it's GTE Spacenet it can.

Whether your offices are separated by miles or oceans, a satellite-based network from GTE Spacenet will improve your communications and your overall operations. You'll have rapid and reliable access to information wherever and whenever you need it.

At Prudential Securities, a network from GTE Spacenet will deliver data, video and voice information to 5,500 brokers nationwide. With this network, Prudential Securities expects to save \$12,000,000 over the next six years. And we guarantee you'll be impressed with the way we meet your needs, too. Call GTE Spacenet at 1-800-535-5375 now. We'll show you just how small the world can be.

**GTE** Spacenet

THE POWER IS ON



# MANAGEMENT STRATEGIES

MANAGING PEOPLE AND TECHNOLOGY: USER GROUPS AND ASSOCIATIONS

## Dialogue

Do you see a bright future for groupware?

“Yes. Groupware is going to do for networks what spreadsheets did for computers. There's a whole market that's not yet being tapped. Lotus [Development Corp.] has grabbed people's attention with Notes.

“E-mail was the first groupware product. But E-mail has limitations. It can only go one-to-one or one-to-many. More advanced groupware products complete the communications picture by enabling users to go many-to-many.”

**Brian Plackis**

Network manager  
MCI Communications Corp.  
Richardson, Texas

“Yes. The senior management of University Computing Services uses groupware to conduct electronic meetings for strategic planning.

“The groupware software on the market today isn't quite up to the level of functionality we'd like to see, although [Apple Computer, Inc.] Macintosh users have better groupware tools available to them today than users in the PC world.

“We'll continue to explore the available options because groupware systems can foster better collaboration and increased productivity for group projects.”

**Dick Ellis**

Principal analyst  
for network systems  
Indiana University  
Bloomington

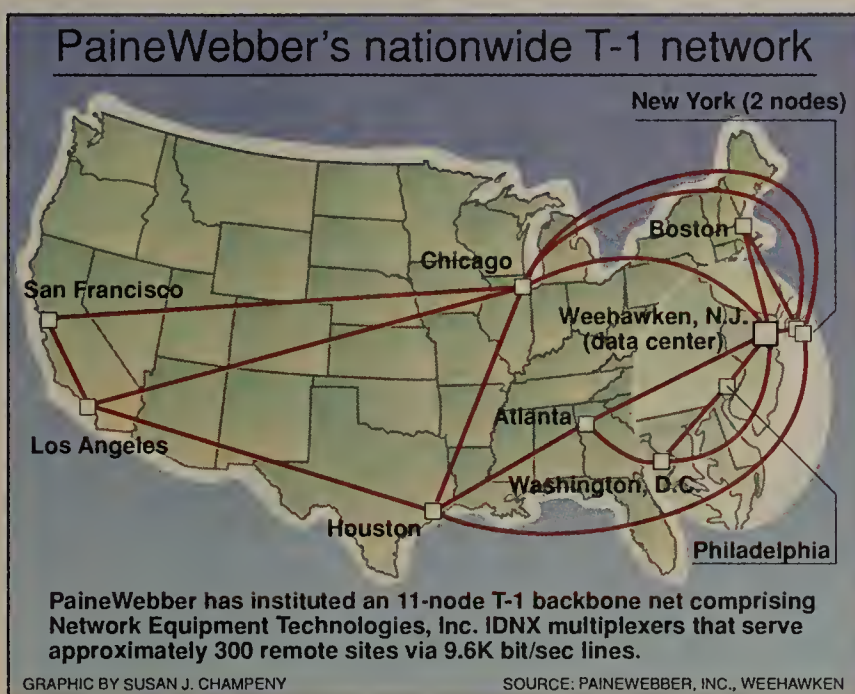
“Yes, but scalability is a major concern with current systems. Groupware is designed to optimize the performance of a tightly knit team, and that naturally has tremendous appeal to any organization. Unfortunately, at a company like Boeing, a team often comprises people from different organizations scattered throughout the world.

“Since the area where we most need the sharing of information and ideas is often between organizations, we need a groupware system that can address the issue of scalability. But most cannot adequately do that yet.”

**Laurie Bride**

Manager of  
communications technology  
Boeing Computer Services Co.  
Seattle

(continued on page 29)



## User learns hard lesson about disaster recovery

PaineWebber establishes plan for catastrophes.

By Maureen Molloy  
Staff Writer

WEEHAWKEN, N.J. — Implementing a durable disaster recovery scheme has become a top priority at PaineWebber, Inc. since two recent catastrophes knocked out communications to more than 60 branch offices.

A fire last winter gutted the company's regional headquarters in Philadelphia, which served as a major node on its nationwide T-1 backbone network, knocking out service to the brokerage firm's entire mid-Atlantic region.

Several months later, a water tower break flooded a regional office in Boston, also a key node on the T-1 net, and barred users in 30 Northeast branch offices from accessing the network.

“We realized it was critical that we devise a formal recovery plan that would enable us to bring branch offices up more quickly after a disaster,” said Gerard Higgins, senior vice-president of communications and computer operations at PaineWebber. “Since drafting the new plan, we've been able to recover from any node problem in under two hours.”

PaineWebber has more than 300 branch offices nationwide connected by a T-1 backbone net. There are 11 major nodes on the network, each of which supports 30 remote sites via 9.6K bit/sec lines.

The fire that blazed through PaineWebber offices in Philadelphia last winter destroyed a Network Equipment Technologies, Inc. IDNX multiplexer, an AT&T Definity private branch exchange, and the terminals and server that provide access to the Quotron Systems, Inc. stock information system.

Higgins said his company, an AT&T Tariff 12 user, worked closely with AT&T to bring all users back on-line before business resumed Monday morning.

The brokers and other staff at the Philadelphia office were temporarily moved, and their calls rerouted, to the corporate operations facilities here.

A call rerouting plan was also required for the 30 remote sites that were connected to the Philadelphia node.

AT&T rerouted traffic going to the Philadelphia T-1 node to Weehawken so clients could call their brokers without dialing another number. Brokers also had access to the stock reporting system.

The 9.6K bit/sec lines carrying voice and data traffic to remote sites were reestablished at an AT&T central office switch in order to provide access to the New Jersey data center.

“Essentially, we remapped the remote circuits to AT&T's point of presence and had the POP act as the new node,” Higgins said.

Since the fire, Higgins said his department has worked with AT&T to develop a handbook that explains the steps to be taken at each major node to redirect circuits in case a node is disabled.

Backup systems and procedures were also developed so that future rerouting problems could be solved directly from headquarters rather than at the branches.

“At first, we scrambled with different engineering techniques to achieve recovery,” Higgins said. “We now have a remapping plan for every circuit on every node in the network. So if another disaster strikes, technicians need only follow the steps outlined in the handbook.”

## Outsourcing unlikely to offer big savings

Consultant says the idea that outsourcing can improve a company's bottom line is overblown.

By Wayne Eckerson  
Senior Editor

WASHINGTON, D.C. — Outsourcing the corporate network can be a wise strategic move but not if the goal is to reduce costs and pad a company's bottom line.

That's according to Howard Frank, founder and former chairman of Network Management, Inc., a systems and network integration company in Fairfax, Va., with \$52 million in annual revenue. He is currently an independent consultant here as well as a part-time professor at the University of Pennsylvania's Wharton School.

Frank, who speaks frequently on the topic of network outsourcing, said executives at many companies are attracted to outsourcing because it offers the potential for controlling skyrocketing communications costs. However, in most cases, executives who undertake thorough analyses of network expenditures are surprised — and somewhat disappointed — that outsourcing will not generate the expected cost savings.

“Network outsourcing is not

the big financial winner some people think,” Frank said, pointing to several reasons why companies won't save money by outsourcing their network.

The obvious target for savings is eliminating labor costs, which typically account for about 40% of overall network expenditures. While some net departments may be overstaffed, outsourcing firms would only be able to pass along significant savings if they could cut in half the staff required to support an organization's net-  
(continued on page 30)



Howard Frank

## NW Budget Survey of 400 firms now available

Network World is selling copies of its 1991 budget survey, the findings of which were summarized in the recent article “Capital equipment budgets showing dramatic growth” (NW, Sept. 23).

Although the article analyzed the major trends uncovered in the survey, which detailed the network spending practices of nearly 400 companies, the compiled report contains data that could not be included due to space constraints.

The data, categorized by vertical industry and geographic region, includes figures for:

- Total operating budgets for 1990, 1991 and projections for 1992, broken down by salaries, training, travel, overhead and external expenditures, such as lease expenses, and maintenance and equipment costs.
- Capital equipment expenditures for 1991 and estimates for

1992, including user purchasing plans for local-area network, LAN interconnection, net management and wide-area voice and data net equipment.

- Percentage of budgets allocated to voice, data and video for 1990, 1991 and estimates for 1992.

- Organization reporting structures.

- Size of departmental communications budgets.

- Chargeback practices, including percentage of total line charges charged back to individual departments.

The study comes with a copy of the original article but otherwise consists entirely of tabulated data. No other analysis is provided.

The survey costs \$197 and can be ordered by calling Glena Fasold at (508) 820-7488. Please allow four weeks for delivery. □



People who know Motorola Codex won't be surprised to learn that our new family of V.32 products can meet virtually every product need.

Whether your applications are desktop or mainframe, synchronous or asynchronous, dial or leased line, Motorola Codex provides

the industry's most innovative solutions.

We can maximize uptime by managing your entire network of Codex and non-Codex dial modems. We save you money with the highest rackmount

**"FINALLY,  
ONE VENDOR  
WHO CAN  
MEET ALL MY  
V.32 NEEDS."**



Motorola Codex has a complete line of V.32 dial modems, dial management systems, and nests.

density in the industry and MTBFs of up to 150,000 hours (more than 17 years). And our modems are compatible with all your existing equipment.

Codex V.32 products start at \$795. Every product comes with a full two-year, 24-hour exchange warranty and the kind of service that's given us the largest installed base of modems in the world.

Nobody else offers our combination of performance, economy, and reliability. For more information, call 1-800-426-1212, ext. 7240.

And find out why we are the only V.32 supplier you need.



**MOTOROLA**  
codex





EVEN WITH ALL THE TIME IN THE WORLD,  
YOU STILL NEED GREAT  
INTERNETWORKING TECHNOLOGY.



# ANNOUNCING NEW BRIDGE AND R DELIVERING THE

**Big on products. Big on listening.**

At Vitalink, we've expanded our product line to include some of the most highly advanced routers and network switches in the world.

Yet, to fill your internetworking needs precisely, it takes more than just great bridges and routers. It takes a great listener. To give you all the time you need to communicate all your internetworking needs.

**New products to ease your  
internetworking burden.**

Vitalink has the products to help you tackle the most complex connectivity challenges. And do it cost-effectively. Whether your network is relatively small—or involves hundreds of locations.

For example, Vitalink now offers the industry's first scalable RISC-based bridge-routers, systems that guarantee availability of full native bandwidth to all connected LANs and WANs.



## AND THE TIME IT TA

Also, Vitalink offers the best price-performance, entry level systems designed to support FDDI. Plus, fault-tolerant enterprise-wide data switching systems that provide extremely reliable FDDI and T3 connectivity. In addition, Vitalink now has products that let you migrate IBM SNA traffic to multi-vendor LAN networks.



# ROUTER SOLUTIONS FROM VITALINK. RIGHT TECHNOLOGY.



## WAKES TO GET IT RIGHT.

You're probably not a 9 to 5 company.

Neither are we.

With more installed WANs than any other internetworking company, you can always count on Vitalink to be there for you.

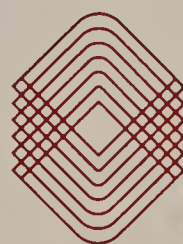
Each of our worldwide offices is staffed with a group of internetworking professionals, includ-

ing a dedicated network design expert. To provide free pre-sale and post-sale network design and configuration consulting. Network modeling and optimization. As well as local area network analysis, trouble-shooting and on-site maintenance.

What's more, we work directly with you to assure maximum network uptime. Our round-the-clock hotline is always there, 365 days a year, with the support you need. When you need it most.

Also, our Network Operations Center uses powerful remote diagnostics to rapidly pinpoint problems. And we give you fast hardware replacement, often within 6 hours.

So, if internetworking pressures have you all wound up, call us now at 1-800-443-5740. And let one of our Vitalink experts sit down with you—and put time on your side.



**VITALINK**  
**IT'S ABOUT TIME.**



# VITALINK ANNOUNCES A TIMELY BOOK TO MAKE THINGS TICK.



## FREE.

Call 1-800-443-5740 today for the comprehensive, 104-page report: *Building and Managing Multivendor Networks Using Bridge and Router Technologies*. A long title that's not short on information—and shows you how to make internetworking technology work best for you. And isn't it high time someone did?



### VITALINK

IT'S ABOUT TIME.



# NW panelists say AT&T outages haven't tarnished carrier's image

Recent incidents could have happened to any other carrier.

By Bob Brown  
Senior Editor

While AT&T's third major network outage in less than two years put another dent in the carrier's marketing strategy, it did not significantly damage AT&T's reputation for providing quality services, according to members of *Network World's* User Advisory Panel.

Panel members suggested that AT&T may need to focus better on routine reliability procedures but agreed that a similar incident could happen to any carrier or user at any time.

A critical AT&T switching center in New York was knocked out for about seven hours three weeks ago due to a power supply problem, disrupting service for thousands of AT&T customers in the area and causing flight delays at nearby airports ("AT&T under fire in wake of big outage," *NW*, Sept. 23). The carrier blamed a supervisor's negligence and faulty alarm systems for its inability to handle the incident before it became a public problem.

"This may be a case of AT&T needing to do a better job of focusing on the basics," such as having supervisors on hand at all times, said Ronald West, president of the Association of Data Communications Users and manager of telecommunications and office automation at Shearman & Sterling in New York.

## Dialogue

continued from page 27

"Yes. We view groupware as the next key software because it goes beyond personal productivity to enabling teams to work together; that's the way real business is accomplished.

"We currently have about 8,000 users throughout the organization using Notes to share information. We use it as a bulletin board and as an organizational "knowledge bank" of our collective expertise and history."

**Sheldon Laube**

National director of  
information and technology  
Price Waterhouse  
New York

"Groupware systems will play a major role in the functionality we'll be expected to deliver to the desktop. It'll have major networking implications because groupware connotes the need to move information between people in various locations.

"Network managers need to better understand groupware systems and where groupware-like applications are heading, not only because of what it offers in terms of productivity improvements, but also because of its impact on the network since there's major traffic associated with it."

**Ronald West**

President of the Association of Data Communications Users and manager of telecommunications and office automation  
Shearman & Sterling  
New York

"Breaking down on basics leads to big problems," he said. "I don't know how much better their operations can get with new technology if they don't focus first on fundamentals."

West said Shearman & Sterling uses network services from AT&T and other carriers but has no intention of cutting back on AT&T services in the wake of the outage.

"From what I've read about the outage

so far, it seems like AT&T's got more of a management problem than a technical problem," he said.

### Holding market line

Charles Murray, president of the Communications Managers Association, said it is unlikely that AT&T's recent network problems will hurt the carrier's position in the marketplace.

"I don't think this is going to change a lot of people's views on AT&T's reliability," he said. "While many customers and the general public were inconvenienced, I don't think it was severe enough to make that happen."

Chuck Papageorgiou, a network administrator for United Parcel Service, Inc.,

agreed with Murray.

"My opinion hasn't changed for the worse about AT&T and the reliability of its network," he said. "AT&T's susceptible to failures just like anybody else. If you've got the largest network in the country, by nature, there are going to be more and bigger failures."

It's only a matter of time before other carriers now hammering AT&T in ads about the outage will have their own problems, Papageorgiou said.

"It's like throwing rocks when you live in a glass house," he said. "They all use [Common Channel Signaling System 7], run fiber cables and use each other's networks. Any one of them could easily be next." □

## Master the power of your network



*"In a time of turbulence and change, it is more true than ever that knowledge is power."* — Sir Francis Bacon

Turbulence is a way of life for the networking and data communications professional today. Keeping pace with evolving technologies — while staying one step ahead of your competition — demands timely information and continuing education.

That's one reason the **ComNet Conference & Exposition** can be the key to unlocking the power of your network. In addition:

- Over 70 sessions in 10 timely tracks will teach you how to take control of the newest breakthroughs and integrate them into your current system.

- A broad range of in-depth tutorials and "hands-on" technical workshops will teach you how to leverage your existing capabilities.

- An in-depth executive symposium focuses on the critical skills and strategies needed by the chief networking officer.

- There's a special Keynote Address by **Dr. George Heilmeier, CEO, Bellcore.**

- Plus, **FREE** admission to **ComNet's** innovative exhibits — where hundreds of leading manufacturers and suppliers announce their new products every year. **Over 500 exhibiting companies in all!**

### Harness the power of your network.

Get the knowledge you need today to drive tomorrow's technologies. For your complete **ComNet** conference program and for a **FREE** "exhibits-only" admission ticket, mail the coupon below, or FAX to 508-872-8237. For additional information call TOLL-FREE: 1-800-225-4698 (or 508-879-6700).

**ComNet: Where your networking solutions BEGIN!**

☐ **YES! I want to master the power of my network. Send me a complete conference program.**

☐ Send me a **FREE** "exhibits-only" admission ticket.

☐ Please send information about exhibiting.

**COMNET**  
January 27-31, 1992 • Washington, D.C.

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Telephone \_\_\_\_\_ Fax \_\_\_\_\_

Mail to: **ComNet**, P.O. Box 9107, Framingham, MA 01701-9107. Or FAX to 508-872-8237. **NWW-1**

ComNet® is produced by World Expo Corporation, an International Data Group Company.



## Outsourcing unlikely to offer big savings

*continued from page 27*

work operations, Frank said.

Such steep cuts are needed to offset the profits that outsourcing firms need to make. That figure could amount to 50% or more of the total savings, as well as overhead and fixed costs. This means outsourcing vendors can save customers significant amounts of money only when the existing network department is inefficiently organized and managed.

"Outsourcing can improve operating efficiencies only if the original department is so incompetently structured that half the staff can be axed," Frank said.

Outsourcing the network does not actu-

ally help companies reduce their telephone bills either, Frank said. While outsourcing firms may have more leverage due to economies of scale, users now can often obtain pricing discounts that rival the fee that outsourcing firms charge for equipment and services.

For example, factors such as Tariff 12 custom network deals and aggregation consortia, which let members pool their calling volumes in order to qualify for sizable discounts, enable users to drive down their calling charges to rock-bottom levels, according to Frank.

User companies can also obtain com-

puter and network hardware directly from manufacturers at relatively the same price that outsourcing firms pay, he said.

Many companies justify outsourcing because it eliminates large capital expenditures for new equipment, such as private branch exchanges. But the elimination of capital expenditures does not mean companies avoid paying for that equipment in an outsourcing deal. Outsourcing vendors simply embed the cost of capital upgrades in the monthly fees they charge. "Outsourcing just creates another form of financing," Frank said.

### Look at the bright side

While outsourcing the network usually cannot be justified from an economic point

of view, there are two solid reasons why companies should consider that option, Frank said.

One is that outsourcing enables companies to obtain workers with the technological expertise they otherwise could not afford to hire or keep in-house for any considerable period of time.

An even better reason is that outsourcing frees the network staff from the mundane task of managing the operation. This enables them to spend more time planning strategic uses of the network to further corporate objectives, Frank said.

"The real value of outsourcing is that it gives internal staff the opportunity to focus on developing the network strategy that will carry the company into the future," he added.

For that reason, Frank encourages companies to outsource as much of the network as possible. His general rule of thumb is to outsource the mundane or tactical parts of the operation while keeping management of the strategic aspects of the network in-house.

**"O**utsourcing can improve operating efficiencies only if the original department is so incompetently structured that half the staff can be axed," Frank said.

▲▲▲

Each company has to determine for itself which portions of the network are strategic and which are not. Some firms may decide to outsource Layers 1 through 4 in the Open Systems Interconnection network model, while others may decide to outsource up to Layer 6 and simply maintain control of the applications running across the network, Frank said.

A company should also consider more than one outsourcing partner, choosing firms whose expertise matches its needs in particular areas. For example, a firm may decide to hand over cable management to one vendor and network changes to another.

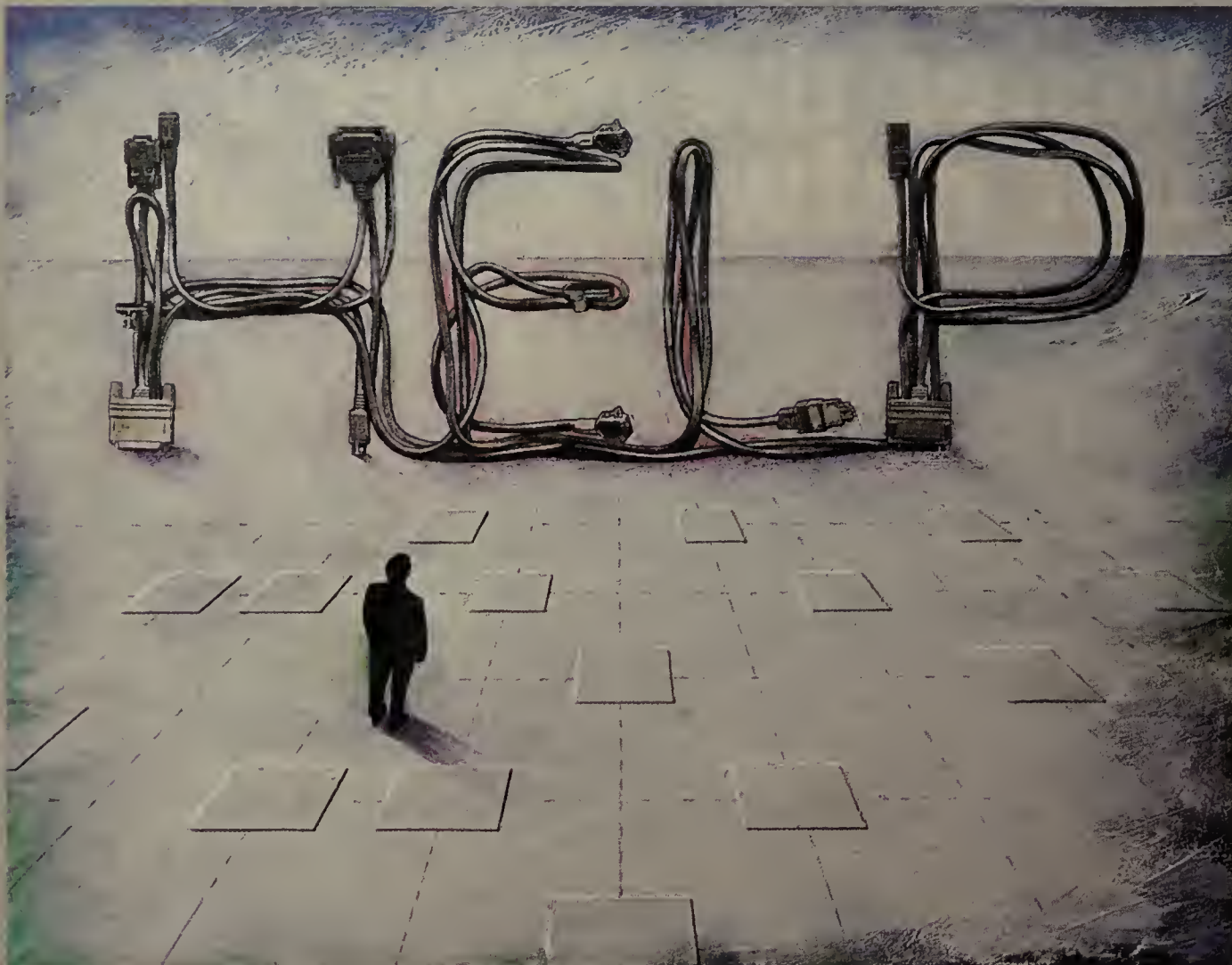
Outsourcing the network to a single vendor may not provide optimal operating efficiencies, and it eliminates the competitive environment that keeps vendors responsive to user needs.

In order to manage multiple outsourcing vendors, Frank said, companies need to do several things.

First, they need to recruit people with program management experience who know how to monitor and manage outsourcing vendors.

Second, companies need to make it easier to outsource parts of their operation. They can do this by establishing both realistic network performance measurements that outsourcing firms will have to meet or exceed, and setting well-defined job descriptions and functional areas within the network department.

Finally, Frank said companies should undertake a comprehensive audit of all networking-related expenditures so they can evaluate the validity of cost-saving estimates offered by potential outsourcing firms. ■



Uh-oh! Trouble in the network.

Good thing you have the Lance+ network management system from Lexcel. With Lance+, you not only can spot problems early, you also have the tools to quickly identify the cause and initiate the solution.

Before the network slows down.

Before any data can be trashed or misrouted.

Before your server drops off line.

And long before users ever see a hint of a problem.

It doesn't matter if the trouble is on the other side of the building or on the other side of the world, Lance+ from Lexcel gives you a global view and reach.

But don't think Lance+ is just a tool to fix your multi-vendor system when something's wrong. It's also the way to design your system right.

With its comprehensive mapping and configuration tools you can keep track of every user — starting at the smallest subnet all the way up to the world level.

And it helps you to define performance benchmarks and monitor actual results in real time *plus* record performance data for long-term analysis.

Want to know more? To talk with a very HELpful sales engineer or for specially HELpful literature, call or write right now.

"SEE US AT INTEROP BOOTH #1206"

Circle Reader Service #134

## LEXCEL

A Micro Technology Company

2600 E. Nutwood Ave., Suite 800, Fullerton, CA 92631  
(714) 680-0100 or (800) 92-LANCE.  
European Headquarters: Carl-Zeiss-Ring 5, D-8045 Ismaning, Germany  
Tel 49-89-9607050 Fax 49-89-9612636

Lexcel and Lance+ are trademarks of Micro Technology.



# All the luxury of a digital service now available with a meter.



"Digital quality? Fiber optic speed? Video Conferencing? Who needs such luxuries?"

You do.

What you don't need is the expense of leasing your own international private line, which your transmission volume won't justify.

Fortunately, our AT&T Switched Digital International Service is dial-up, available on demand and usage sensitive.

You only pay for the point-to-

point digital link when you actually use it. And that opens up a whole world of applications possibilities, from Business Video, Group IV Fax and CAD/CAM to Back-Up and Electronic Data Transfer.

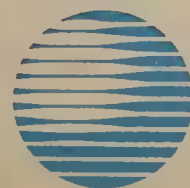
It also opens up any number of different point-to-point connections without the need to manage multiple private lines. Thus optimizing your network at minimum cost.

All we ask is that your fare at the end of the month come to at least \$75.\*

Which, for an idea as simple as a

meter, should certainly set your mind ticking about what else we can do for you.

For more information on how AT&T can help you, please call  
**1 800 448-8600, Ext. 811.**



**AT&T**

The right choice.

\* Access charges not included.





# Tired Of Working This Hard Until Real Network Management Comes Along?

While other LAN companies keep promising real network management, Ungermann-Bass® is delivering the system you need *today*—at a fraction of what you would expect to spend. In just a few months since its introduction, hundreds of enterprises have already chosen NetDirector.™

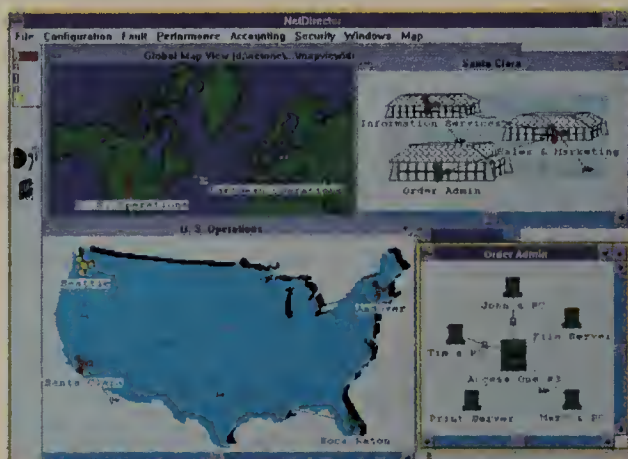
NetDirector delivers the best multivendor management available through its open, standards-based architecture and SNMP. You get true, seamless integration of your entire network, including Ungermann-Bass products such as the Access/One™

smart hub. One logical network, one network manager.

The key to NetDirector's power is the use of a client/server architecture, industry-standard user and application interfaces, and an open SQL database and database manager. The SQL database allows you

to put network information to work for *you* on *your* terms.

So, if you need help with your network management balancing act, call **1-800-873-6381** now to receive a free copy of our NetDirector demonstration diskette.



User-customized screens show your network from a global perspective to device detail.

 **Ungermann-Bass**

Circle Reader Service #130

**Free demo disk. Call now. 1-800-873-6381.**

Ungermann-Bass is a registered trademark and Access/One and NetDirector are trademarks of Ungermann-Bass, Inc. © 1991 Ungermann-Bass, Inc.

"SEE US AT INTEROP BOOTH #2306"



# GLOBAL NETWORKS

USER STRATEGIES, INTERNATIONAL SERVICES & REGULATION

## World News

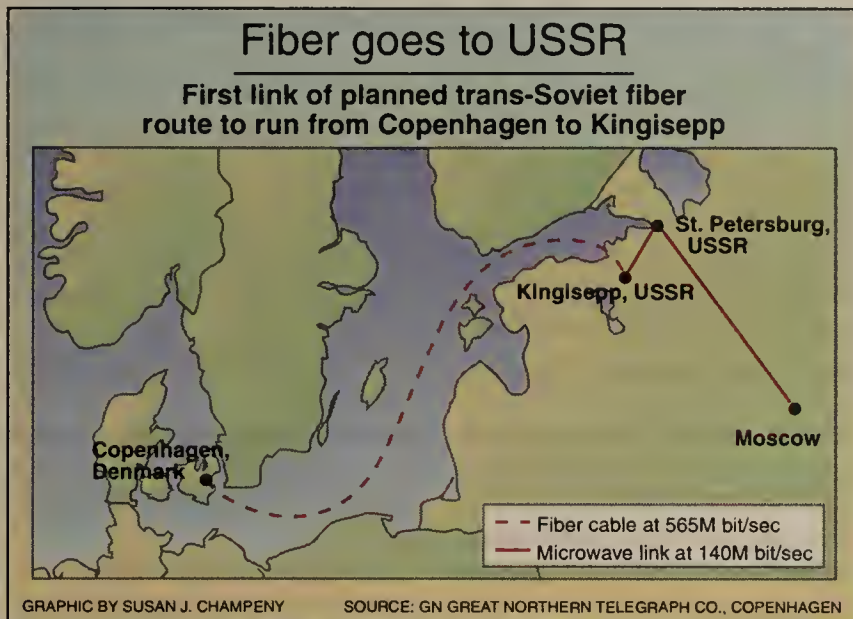
**World Communications, Inc. (WorldCom)** recently said it is building a private international data network for **CompuServe, Inc.** that will extend CompuServe's packet network into the U.K. and Germany.

Ron Spirig, WorldCom's vice-president for North America, said the company will connect sites in London and Frankfurt, Germany, to its U.S. technical operations center in New York through diverse routes running over Trans-Atlantic Telecommunications-8 and Private Trans-Atlantic Telecommunications-1 cables. The London and Frankfurt nodes will be connected to each other through wideband fiber procured by WorldCom via the respective national carriers.

Customers in London can now access CompuServe's network directly. Those in U.K. locations outside of London may gain access through a local connection to the PSS Dial-Plus packet network. In Germany, users can access the CompuServe service directly in Frankfurt and Munich. They can gain access through a local connection to the Datex-P packet net if they are based elsewhere in the country.

Andrew May, CompuServe's director of network marketing, said the network enables his firm to expand its X.25 access and 9.6K bit/sec asynchronous dial access services to Germany and the U.K. Next year, CompuServe plans to extend its frame relay service to those locations as well.

(continued on page 34)



## Danish firms award pact for undersea link to USSR

Int'l fiber cable paves way for Trans-Soviet Line.

By Joanne Cummings  
Staff Writer

**COPENHAGEN, Denmark** — Two telecommunications companies based here, state-owned Telecom Denmark and GN Great Northern Telegraph Co., have awarded a contract valued at \$65 million to lay the first international undersea fiber cable into the USSR.

STC Submarine Systems, a subsidiary of Northern Telecom, Ltd. based in London, won the contract to build a 1,260-km link across the Baltic Sea connecting Copenhagen and Kingisepp, USSR, which is just outside St. Petersburg, formerly Leningrad (see graphic, this page).

The companies envision the 565M bit/sec fiber link as the first leg in a proposed Trans-Soviet Line cable system, which is designed to run across the Soviet Union, connecting Europe with Japan and Korea. Currently, if a user wants a fiber path from Europe to the Far East, it must pass through the U.S.

Telecom Denmark and GN

Great Northern — which have invested a total of £44 million (\$76 million U.S.) in the first phase of the project — said they expect to recoup their investment through traffic fees.

The link, which is expected to be cut over in February 1993, will have the capacity to carry 16,000 telephone, facsimile, data or video transmissions simultaneously.

Telecom Denmark and GN Great Northern are part of an international consortium that is working on building the Trans-Soviet Line. That group includes representatives from companies such as British Telecommunications PLC, Deutsche Bundespost Telekom, Kokusai Denshin Denwa Company, Ltd. and US West, Inc.

The consortium envisions the next phase of the project to be a ground fiber link from Moscow to Vladivostok, USSR (see graphic, page 34). From Vladivostok, undersea fiber cables would hook up to Japan and South Korea in order to complete the route.

(continued on page 34)

## Muxes to route voice via switched circuits

Republic Telcom mux seen as boon for global private net users to support switched services.

By Barton Crockett  
Senior Editor

**BOULDER, Colo.** — Republic Telcom Systems Corp. recently disclosed plans to upgrade its line of multiplexers and compressed voice switches by next year with the ability to route compressed voice traffic over switched digital circuits.

Republic Telcom, which sells products used on international private networks, recently announced its first multiplexer to support switched digital circuits. The RLX-4N SD supports a maximum of two switched 56K or 64K bit/sec circuits and can extract up to four 11K bit/sec voice channels and two 9.6K bit/sec data or facsimile channels from a single switched 64K bit/sec circuit.

The RLX-4N SD can be programmed to route calls over switched digital links during certain times of the day or on demand. The multiplexer costs between \$5,500 and \$15,000, depending on configuration and the country in which it is installed.

### Peak traffic

Analysts said the ability to route compressed voice over switched digital links will be particularly attractive for spillover traffic from international private lines.

Private lines between the U.S. and Europe, for example, tend to have high calling volumes during the early morning hours because of the limited overlap in business hours on the two continents.

Calling volumes can exceed private-line capacity during these

peak periods, and calls must be routed over public switched facilities. In most instances, per-minute charges for routing four voice calls over a single AT&T switched 56K bit/sec Switched Digital International circuit will be less than the cost of routing calls over switched telephone links.

"This is a good alternative [for spillover voice traffic] for companies with private networks," said Jeanne-Marie Jarka, AT&T's Switched Digital International product marketing manager in Morristown, N.J. AT&T markets Republic Telcom equipment and offers international switched 56K and 64K bit/sec services to 13 countries, including Germany, Japan and the U.K.

Nick Lippis, principal consultant with Strategic Networks Consulting, Inc., in Rockland, Mass., agreed that routing compressed voice over international switched digital links could be a cost-effective way to carry spillover traffic from international private lines.

But he said the feature probably would not make much economic sense domestically since domestic switched digital services are expensive and users can obtain inexpensive virtual private network calling services.

However, according to Robert Hanson, Republic Telcom's vice-president of product development, marketing and engineering, the ability to support switched digital links will be good for disaster recovery purposes because it will enable users to back up private lines more easily.

Hanson said Republic Telcom (continued on page 35)



## Here's your chance to be Communicator of the Year.

If you're proud of your company's international telecommunications network, it's time to stand up and be recognized. All you have to do is enter our ICA/WorldCom International Communicator of the Year Award competition. In January, a panel of judges

from ICA will review all entries and select the one that best provides its company with a competitive edge in the global marketplace.

If you are the lucky recipient of the award, you'll get something no money can buy: the honor of being the first annual award winner, as well as the recognition of your peers at ICA's 1992

conference in Atlanta. We'll also present your company with the elegant Steuben sculpture, "Day and Night," by David Dowler, as a permanent reminder of your achievement.

But you can't win if you don't enter. Call today and we'll rush you an application and all the details.

In the U.S.: 1-800-733-3755

In the U.K.: 44.71.490.4332

In Germany: 49.69.29892.0

**WorldCom**

THE INTERNATIONAL TELECOMMUNICATIONS SPECIALISTS • A TELE COLUMBUS COMPANY

Circle Reader Service #117



## Firms award USSR link

*continued from page 33*

But the rest of the route has yet to be approved by the Coordinating Committee for Multilateral Export Controls (COCOM), a Paris-based organization that limits the export of high-technology goods with possible military applications to Eastern Bloc countries.

COCOM has approved the first leg of the cable into Kingisepp because the originating end of the cable is outside the Soviet Union

Great Northern.

Leslie Hepden, public relations manager at STC Submarine, said she was optimistic about COCOM's eventual approval of the Trans-Soviet Line project. She cited the fact that just this year, COCOM relaxed the restrictions on fiber cables to and within Czechoslovakia, Hungary and Poland.

"Things are changing rapidly," Hepden said. "I don't think one should rule out the Trans-Soviet Line. It's just a question of time." She declined to estimate when COCOM approval could be

"I don't think one should rule out the Trans-Soviet Line. It's just a question of time."

▲▲▲

and the other end penetrates no more than 10 miles into Soviet territory. But it has failed to approve the second leg of the project, the link from Kingisepp to St. Petersburg and then to Moscow.

Therefore, that section will consist of a 140M bit/sec microwave radio link, according to GN

expected.

Besides waiting on that approval, the recent political upheavals in the Soviet Union have raised questions about the project's success.

Thomas Duer, president and chief executive officer of GN Great Northern, remains un-

daunted however. He said his company has been doing business with the Soviet Union since it built the first telegraphic cable linking the Far East and Europe 122 years ago.

"During those years," Duer said, "there have been many shifts in leadership [in the Soviet Union], but it has never stopped our cooperation."

As an example, Duer cited the August coup attempt in the Soviet Union. He said there were five representatives from the Soviet Ministry of Telecommunications here at the time discussing plans for the undersea fiber cable to Kingisepp. "We were told from Moscow that we should just con-

tinue our work on the project and our negotiations as if nothing had happened," he said. "And that is what we did."

He added that the agreement has now been transferred from the Soviet Telecommunications Ministry to the Russian communications authority but that no changes were made.

"They completely stick to what has been agreed upon," he said.

Duer also declined to estimate when COCOM may give its approval to the project. "We are just happy that we can get started on the project," he said. "It should fulfill our requirements for quite some time." □



## World News

*continued from page 33*

CompuServe opted for WorldCom, May said, because the latter agreed to collocate and maintain CompuServe's packet switches at locations overseas as well as provide facilities maintenance.

May said expanding the CompuServe network to the U.K. and Germany was made possible in part by new regulatory developments in both countries. Those rules now permit WorldCom to provision both the U.S. and overseas portions of international leased lines serving the U.K. and Germany.

Next year, CompuServe hopes to extend its services into Belgium, Paris and Switzerland. It will use WorldCom facilities where possible, May said.

**Societe Internationale des Telecommunications Aeronautiques (SITA)**, a nonprofit value-added network for the airline industry, recently announced a new electronic data interchange link to the Belgian Customs Agency's SADBEL computer system. The link allows airlines to send customs documents through the SITA network to the customs agency.

# Dial-Up Internetworking. The Most Cost-Effective Connection For Your Enterprise.

Conventional internetworking lets you connect widely-separated workgroups into a single, enterprise-wide network. But only at a very expensive price.

Which is why we believe Dial-Up Internetworking is an idea whose time has come.

Dial-Up Internetworking is the most cost-effective way to extend your enterprise network to the smaller, remote workgroups that comprise the bulk of the internetworking market. It uses the general switched telephone network, limiting the need for the high-performance T-1 lines and high-speed routers that drive up conventional internetworking costs.

Dial-Up Internetworking is made practical by another Telebit® first – a powerful automated dial-up router called NetBlazer. NetBlazer provides low-cost





The Belgium carrier **Regie des Telegraphes et Telephones (RTT)** recently announced the appointment of executives to head up its operations following a government-imposed breakup of the carrier, which is slated to go into effect later this year.

As part of a major new telecommunications law, called the Belgium Telecommunications Act, RTT will be split into two separate units. Belgacom will handle carrier operations and commercial services now managed by the RTT. The Belgium Institute for

Postal and Telecom Services will be in charge of Belgium's network regulations.

Bessel Kok, chief executive officer of the Society for Worldwide Interbank Financial Telecommunication, a global bank network, will be the managing director of Belgacom.

Benoit Remiche has been nominated to become president of Belgacom's administrative council, roughly equivalent to the carrier's board of directors. He is currently chief cabinet advisor to Belgium Vice-Premier Melchoir Wathelet. **■**

## Muxes route via switched circuits

*continued from page 33*

plans to enhance next year its RLX-4N, RLX-8N and RLX-16N multiplexers as well as its Rnet compressed voice switching system to support switched digital links.

Additionally, Hanson said the company plans to support switched digital links on a new line of multiplexers, dubbed the D Series, that will be introduced next year and will support T-1 and E-1 wide-area links.

Currently, Republic Telcom's

equipment only supports wide-area network links up to 128K bit/sec.

The company displayed a prototype version of a D Series multiplexer in its booth at the 1991 TCA Annual Conference last month in San Diego.

Republic Telcom is not the only vendor to support switched digital access on its multiplexers. Newbridge Networks, Inc., Network Equipment Technologies, Inc. and Timeplex, Inc. are among those firms that now either sell products supporting this capability or have plans to do so in the future. **■**

## American Airlines opts for SITA over int'l private net

User says PTTs must lower costs, boost nets.

By Barton Crockett  
Senior Editor

FORT WORTH, Texas — Even though American Airlines, Inc. has doubled its transatlantic flights over the past two years and has vaulted into the leading position for Latin American flights, the airline recently said it has no plans to build a global data network.

Instead, the company is taking a more conservative route to satisfy its international data communications needs by expanding its commitment to use public X.25 packet-switching services from Societe Internationale des Telecommunications Aeronautiques (SITA), a nonprofit value-added network for the airline industry.

The airline already uses SITA for the bulk of its international data traffic, according to William Jewell, American's telecommunications manager. He said SITA's network is better able to meet the airline's network needs than mo-

nopoly carriers in many foreign countries.

"I believe that, costwise and performance-wise, PTTs have to improve [before American can install a global private net]," Jewell said.

### Constant evaluation

American is continuously evaluating whether it should replace its SITA services with a global private network, Jewell said. While the airline relies extensively on SITA services, it does operate a handful of internal private lines connecting its massive U.S. network to a node in London and a handful of nodes in Canada, the Caribbean and South America. American's private net is based on packet switches from Northern Telecom, Inc.

The company's international private-line network is unlikely to expand much in the future, even though the airline itself has aggressively expanded in the past few years by purchasing London

landing sites from Trans World Airlines, Inc. and all of Eastern Air Lines, Inc.'s Latin American routes, Jewell said.

He acknowledged that, in some areas, American generates enough traffic to justify international private-line service, but he said traffic levels are not the only factor being considered in a decision to build a global private net.

### Maintaining an edge

American also wants to ensure that it receives high-quality service from its net service providers. "Quality is our primary driver," he said.

On that count, SITA has an edge. Jewell said American has become one of SITA's biggest customers.

By contrast, if the airline were to build a global private network, it would become only one of dozens of organizations leasing private lines from national monopoly carriers.

"It's all economies of scale," he said. "Heavy-volume users get the attention they deserve."

Jewell added that American may never build a large international private network until competition heightens, service improves and private-line prices fall in many countries. **■**

WAN capability on TCP/IP networks, supporting dial-up lines. It's the first product to combine the full suite of open systems standards in high-speed modems with those of TCP/IP internetworking.

NetBlazer uses the complete Telebit family of high-performance modems to connect remote locations in your organization together in a virtual wide area network, giving remote users transparent access to all network computing resources at a far lower cost than is possible with conventional internetworking technology. It complements the high-speed routers that move information over the corporate backbone.

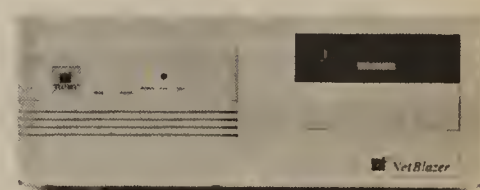
Additionally, NetBlazer acts as a terminal server or modem pool. It can route Ethernet to Ethernet.

And can even use 56K leased lines.

WAN IP routing over dial-up is incredibly fast, thanks to NetBlazer's support for standard SLIP and PPP protocols combined with advanced techniques like TCP/IP header compression.

Dial-Up Internetworking is the kind of clear-sighted advance our customers have come to expect from Telebit. We've become the leader in high-speed, dial-up modems by delivering faster, more robust and reliable performance in mission-critical applications.

Call 1-800-TELEBIT for free information on NetBlazer. And find out why Dial-Up Internetworking is the most cost-effective connection your enterprise can make.



**TELEBIT®**

**First in Dial-Up  
Internetworking.**





# Communications to help you outrun the competition.



The race is to the swiftest, and the right communications systems can help you speed up your customer service, maintain tighter inventory control, track sales data better, and improve the bottom line. Ameritech can help you do all this, and more.

Whether you're a small entrepreneur or a billion-dollar business, you'll find the technologies, services and expertise you need waiting for you at the communications companies of Ameritech.

We've created specialized communications solutions to meet the individual needs of thousands of Great Lakes companies, and we can do the same for you. Because the better you run your business, the better you can outrun your competition.

**Solutions that work:** From basic business communications to integrated network management products, from yellow pages advertising to equipment leasing, Ameritech has the people, products and services to meet your particular needs.

For more information, just call us at 1-800/242-8580.

## The Communications Companies of Ameritech:

Illinois Bell

Indiana Bell

Michigan Bell

Ohio Bell

Wisconsin Bell

Ameritech Audiotex Services

Ameritech Credit

Ameritech Development

Ameritech Information Systems

Ameritech International

Ameritech Mobile Communications

Ameritech Publishing

Ameritech Services

The Tigon Corporation

# **AMERITECH**



**TOTAL  
ENTERPRISE  
NETWORKING  
IS A MYTH.**

**RIGHT?**



**WRONG.**

**YOU JUST  
HAVE TO KNOW  
WHERE TO  
GET IT.**



FOR TOTAL ENTERPRISE NETWORKING,  
THIS IS WHAT YOU REALLY NEED.

1. THE BROADEST RANGE OF NETWORKING TECHNOLOGIES: T-1/E-1, FT-1, T-3, X.25, ISDN, FRAME RELAY
2. MULTIPROTOCOL ROUTERS FOR ETHERNET, TOKEN RING AND FDDI LANs
3. ACCESS TO SWITCHED AS WELL AS DEDICATED PUBLIC NETWORKING FACILITIES
4. INTEGRATED NETWORK MANAGEMENT
5. SERVICE AND SUPPORT AROUND THE WORLD
6. STANDARDS-BASED EQUIPMENT
7. THE ABILITY TO DELIVER IT ALL TO YOU NOW!

THERE IS ONE COMPANY THAT CAN PROVIDE IT ALL...







# Time LAN

**To create a LAN internetwork that works for you.**

Internetworking dissimilar LANs has become a vital priority for network managers. But without the right vendor, integrating LANs can become a network nightmare. As LANs carry increasing amounts of mission critical data, it's only natural to look for ways to make better use of both your data and your wide area network. Which is the best reason to choose TIME/LAN™ systems. Because, on all levels, TIME/LAN delivers. As you read this, we are installing some of the largest LAN internetworks ever built around the globe.

**So you'll never have to go back to square one.**

Even with a LAN internetwork in place, you will still need to expand its capabilities. Improve its performance. And find new ways to keep costs down. Your equipment will have to work in a multi-vendor environment. TIME/LAN recently successfully completed ANTC testing, demonstrating our commitment to interoperability for Ethernet, Token Ring and FDDI LANs. Engineered to fit with other pieces of your total network, high performance TIME LAN internetworking systems and services help protect both your current and future investment, as the gears of your existing information systems mesh in a fully-integrated, total enterprise network.

**So you're set for the future.**

TIME/LAN keeps you at the forefront as bridging and routing technology continues to evolve. We route commonly used protocols such as TCP/IP, IPX and XNS, and support emerging industry standards such as OSPF for efficient routing and SNMP for network management. Our users are already securely positioned for future growth into SONET/SDH and FDDI II. And with our Frame Relay interface, you have the flexibility to access public or private frame relay networks, whether these networks are from Timeplex or other vendors.

**A stable vendor that is also a major force in the LAN internetworking market.**

Timeplex, with over 22 years of leadership in data communications, provides its TIME/LAN users with the industry's most comprehensive customer service including network analysis, design, contingency planning, integration and customer training. Sophisticated service and support to match the complexity of your network 24 hours a day, around the world. TIME/LAN To meet your needs today. And tomorrow.

**TIME/LAN Internetworking.  
Its time has come.**



## THE ONE COMPANY FOR YOUR TOTAL ENTERPRISE NETWORKING NEEDS.

**To set a higher standard for your enterprise network.**

You want to create a total enterprise network based on your own user-to-user networking needs, not on a given vendor's product offering. Timeplex has been setting the standard in communications networking for over 22 years. With the largest customer base, Timeplex's extensive global networking experience provides you with system solutions that integrate your diverse departments and work groups into one total enterprise network.

**To connect your entire organization.**

Timeplex offers the broadest range of networking solutions, from T-1/E-1, FT-1, T-3, X.25 and ISDN to the most extensive Frame Relay products, which cover both access and switching. Our wide area systems give you access to public networks, help you build hybrid networks and give you more options than any other networking company. What could be better?

**To have LAN expertise at your fingertips.**

Our LAN internetworking expertise can help you move and manage information between people quickly and easily. By combining multiple LANs such as Ethernet, Token Ring and FDDI, as well as concurrent transport capabilities for HDLC and SNA traffic, Timeplex offers you maximum flexibility. Our superior TIME/LAN internetworking systems offer you the security and confidence of dealing with a worldwide leader in communications networking.

**To maximize your network efficiency and availability.**

As networks become more complex and carry more and more mission critical information, you want to monitor your entire network easily and quickly. Timeplex offers you a single point of control and management. This single control integrates your LAN internetworks and your wide area network onto one management platform. Giving you the total picture at any given time.

**To have support around the clock, around the world.**

No other communications vendor offers our level of applied technology solutions and critical customer support. We help you streamline resources and improve network performance. From our consultative pre-installation support through professional services such as our LAN/WAN network evaluation and design, systems integration, outsourcing, plus worldwide support from facilities to equipment, 24 hours a day.

Timeplex designs, develops and manufactures the products for your enterprise network. And either directly or through its highly trained international distributors, Timeplex installs and services your entire network. All to help you take your enterprise to new heights of efficiency.

Total enterprise networking is no myth. It's here today. At Timeplex.

**Timeplex.  
Total Enterprise Networking.**

# Timeplex



**CORPORATE HEADQUARTERS**

400 Chestnut Ridge Road  
Woodcliff Lake, NJ 07675 U.S.  
(800) 669-2298  
(201) 930-4600

**U.S. REGIONAL SALES OFFICES**

Rochelle Park, NJ  
(201) 368-1113

New York, NY  
(212) 406-4990

Shelton, CT  
(203) 925-0533

Atlanta, GA  
(404) 955-2003

Dallas, TX  
(214) 392-2293

Lombard, IL  
(708) 515-5910

Overland Park, KS  
(913) 491-5713

San Mateo, CA  
(415) 574-8800

Irvine, CA  
(714) 851-2442

**U.S. FEDERAL BUSINESS**

Fairfax, VA  
(703) 385-3366

**U.S. CUSTOMER SUPPORT/EDUCATION**

Clearwater, FL  
(813) 530-9475—Support  
(800) 356-8338—Education

**TIMEPLEX LAN SYSTEMS**

United States  
(800) 755-TLAN

Canada  
(800) 755-TLAN

Europe/Africa/Middle East  
(447) 5354-3559

Pacific/Asia/Latin America  
Contact your local Timeplex office

**CANADA**

30 Fulton Way, Richmond Hill  
Ontario, L4B 1E6  
(416) 886-6100

**EUROPE/AFRICA/MIDDLE EAST HEADQUARTERS**

Langley Business Centre  
Station Road, Langley  
Slough, Berks., SL3 8DT, U.K.  
(447) 5354-3559

**UNITED KINGDOM**

Langley Business Centre  
Station Road, Langley  
Slough, Berks., SL3 8DT  
(447) 5354-3559

**BELGIUM**

Avenue Marcel Thiry, 200  
1200 Brussels  
(322) 762-1696

**DENMARK**

Postboks 2571, Ryegade 45  
DK-2100 Copenhagen O  
(453) 536-0088

**FRANCE**

39 Ave des Trois Peuples  
78180 Montigny-le-Bretonneux  
(331) 3064-8100

**PACIFIC/ASIA/LATIN AMERICA HEADQUARTERS**

400 Chestnut Ridge Road  
Woodcliff Lake, NJ 07675 U.S.  
(201) 930-4666

**AUSTRALIA**

213-219 Miller St., 10th Floor  
North Sydney, NSW 2060  
(612) 957-1660

**NEW ZEALAND**

Ground Floor, Plimmer House  
99 Boulcott St., Wellington  
(644) 711-287

**FAR EAST**

National Mutual Centre  
151 Gloucester Rd., Hong Kong  
(852) 833-6848

---

T-1/E-1 Networking Systems/Multiprotocol and FDDI Routers, Bridges and Concentrators/  
X.25 Packet Switches and PADs/T-3 Super Transport Systems/ISDN Gateway Products/  
Cell Relay Switching Systems/Intelligent T-1 Channel Bank/Network Management Systems

---



Total Enterprise Networking



# PRODUCTS & SERVICES

THE LATEST OFFERINGS FROM VENDORS AND CARRIERS

## First Look

### Clearpoint offers two RISC-based bridges

**Clearpoint Research Corp.** recently added two Reduced Instruction Set Computer (RISC)-based Ethernet bridges to its Constellation bridge line.

Both bridges are compatible with IEEE 802.3 and Digital Equipment Corp.'s Ethernet Version 2.0 local-area networks. In addition, both fully support the IEEE 802.1d Spanning Tree Protocol.

The products support protocol filtering and can be managed via StarWatch, Clearpoint's integrated menu-driven network management package, or by any Simple Network Management Protocol-based network management system.

Like all other Constellation bridges, the new offerings support the Management Information Base II.

The first bridge, dubbed **Pyxis**, is a RISC-based, standalone, notebook-sized device with four ports for linking as many as four local Ethernet LANs and one wide-area network port supporting speeds up to 256K bit/sec.

Pyxis offers 59K packet/sec filtering and 29K packet/sec forwarding rates. The product discards errored packets and forwards only those packets that conform to IEEE 802.3 standards.

The bridge provides for wire speeds of 10M bit/sec on all of its local ports and supports 10Base2 for thin-wire Ethernet LAN connections.

Pyxis is available now and is priced at \$5,995.

The second bridge, dubbed **Carina**, supports the same features as Pyxis. It is a RISC-based, multiport motherboard that can be installed in any VMEbus-based system. Carina does not affect processing on the VMEbus systems, although it does draw power from the host computer.

The product operates with a 120M bit/sec high-speed bus, and a parallel bus between each port allows for Ethernet switching at 10M bit/sec.

Carina is available now for \$4,995.

**Clearpoint Research Corp.**, 35 Parkwood Drive, Hopkinton, Mass. 01748; (508) 435-2000. ☐

## New gateway links LAN PCs to hosts

By Jim Duffy  
Senior Editor

TEMPE, Ariz. — IDEA recently unveiled a gateway that establishes concurrent host sessions between LAN-attached personal computers and multiple mainframes and minicomputers.

The IDEAcmm Gateway is targeted at users who need access to multiple hosts from token-ring networks running Novell, Inc. NetWare or IBM's PC LAN Program.

"We're trying to give the corporation the flexibility to change networks and support host environments," said Michael Chatterton, IDEA's product line manager of processing terminals. "Multi-host environments can be fairly complex."

The gateway consists of Host Link Adapter Cards and software, which are installed on a personal computer-based server that also doubles as the gateway. As many as four Host Link Adapter Cards can be installed on each server, providing communications to multiple mainframes or minicomputers using X.25 connections or Synchronous Data Link Control at up to 64K bit/sec.

When linked to an IBM Application System/400, the gateway can support up to 1,000 sessions on a personal computer local-area network or as many as 16,000 sessions when connected to a mainframe, Chatterton said. Up to 10 host sessions can be supported concurrently on each personal computer.

The IDEAcmm Gateway software allows host sessions, two on-screen notepads and DOS applications to be displayed in overlapping windows on LAN-attached personal computers. The gateway supports IBM 3270 and 5250 terminal emulation and PC Support implementations for AS/400, System/36 and 38, as well as 3270 text and all-points-addressable terminal emulation.

In a single-user configuration, the IDEAcmm software can connect a personal computer to a remote IBM mid-range or mainframe via 5250 or 3270 protocols.

The IDEAcmm Gateway adapters are priced at \$625 and \$655 for personal computer and Micro Channel Architecture-based devices, respectively. The software costs \$9,495 for a 256-user version, \$1,495 for the eight-user package and \$395 for the single-user version.

IDEAcmm Gateway is expected to be available in December.

For more information, contact IDEA at 1515 W. 14th St., Tempe, Ariz. 85281; (602) 894-7000. ☐

## BICC unveils SNMP support for its net mgmt. system

By Wayne Eckerson  
Senior Editor

AUBURN, Mass. — BICC Communications recently announced two software products that add Simple Network Management Protocol (SNMP) support to its ISOVIEW network management system.

The addition of the SNMP-based software, which resides on a personal computer along with the ISOVIEW Network Manager software, gives ISOVIEW users the option of employing SNMP or Common Management Information Protocol (CMIP) to manage network devices.

The ISOVIEW SNMP Management Option enables ISOVIEW, BICC's personal computer-based, icon-driven net management system, to manage any network device that has an SNMP agent. ISOVIEW currently supports CMIP.

BICC also announced ISOVIEW SNMP Gateway Option software that links ISOVIEW to other SNMP-based network management systems. The software en-

ables ISOVIEW to function as a domain manager that feeds alarms and errors occurring in one or more local-area networks to an enterprisewide network manager, such as Sun Microsystems, Inc.'s SunNet Manager.

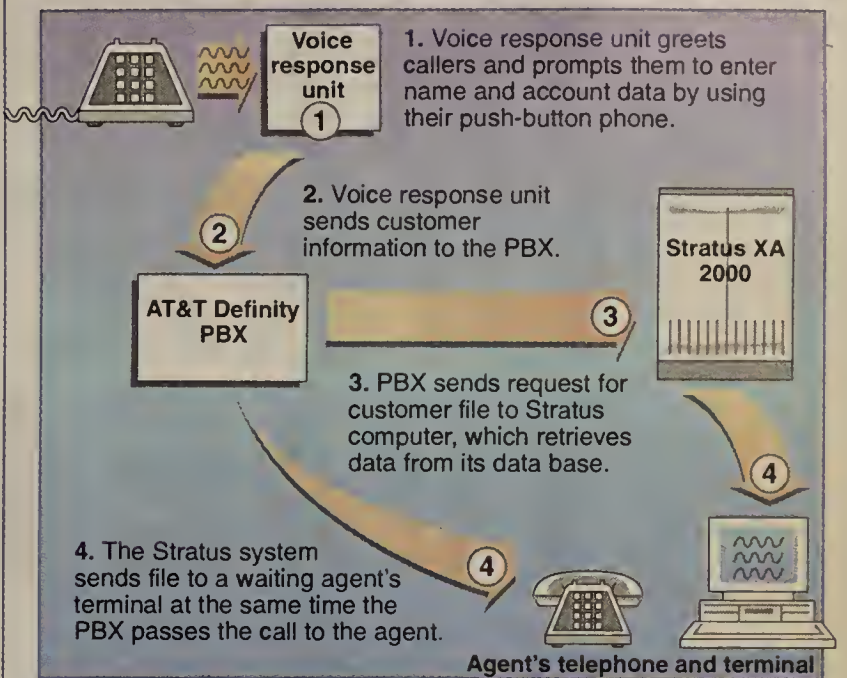
BICC also announced an enhancement to its EtherConnect System (ECS) intelligent hub. The ISOLAN SNMP Management Card, which fits into a slot in the ECS, configures the ECS as an SNMP agent that can be managed by any SNMP-based management system. Currently, ECS supports a CMIP interface.

The ISOVIEW SNMP Management Option software costs \$3,000, and the ISOVIEW SNMP Gateway Option software costs \$1,500. Both are available now. The ISOLAN SNMP Management Card for ECS is expected to be available next month for \$1,995.

For more information, contact BICC at 103 Millbury St., Auburn, Mass. 01501, or call Mark Dayton at (508) 832-8650 or (800) 832-8650. ☐

## Stratus, AT&T unveil PBX-to-host link

New software brings screen of data, along with voice call, to waiting agent.



GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: STRATUS COMPUTER, INC., MARLBOROUGH, MASS.

## Stratus, AT&T unite on calling interface

New software combines Stratus computers with AT&T PBXs to reduce call delays for information.

By Joanne Cummings  
Staff Writer

MARLBOROUGH, Mass. — Stratus Computer, Inc. and AT&T recently announced a new software interface that links Stratus computers with AT&T PBXs to enable users to receive an incoming call together with a screen of data about the caller.

The interface is designed to enable users in companies such as banks, brokerage firms and travel agencies to improve their customer service operations by eliminating the delays callers experience when an agent searches for account information.

The interface consists of the Stratus Adjunct Interface (SAI) software, which runs on a Stratus XA 2000 Continuous Processing System running Stratus' FTX version of Unix System V, and AT&T's CallVisor Adjunct Switch Application Interface (ASAI) software, which runs on AT&T's Definity private branch exchange.

Together, the components enable users and software vendors to write, for example, telemarketing applications that take advantage of the XA 2000's on-line transaction processing capabilities and the Definity's automatic call distribution functions.

Stratus said it is making its SAI product, which supports Integrated Services Digital Network services and the entire Open Systems Interconnection protocol stack, open to all third-party software developers.

When customers call into a company with SAI and CallVisor ASAI installed, they are greeted by a voice response unit that prompts them to use a push-button telephone to enter information, such as their name and account number.

Alternatively, if the company is using ISDN, the PBX can obtain the customer information using its direct number identification service feature.

### Information path

CallVisor ASAI takes the information and sends a request for the customer's file to the SAI on the Stratus computer. The XA 2000 receives the request and searches its data base for the correct file. The XA 2000 then sends the customer file over a standard Ethernet or asynchronous connection to a customer service agent's terminal at the same time that the PBX sends the agent the customer's call (see graphic, this page).

The agent may then make any changes or updates to the file using any type of terminal. Once the customer transaction is completed, the file is stored again on the XA 2000.

Pricing and availability for the SAI will be determined by year end. CallVisor ASAI, which will be available in March, is priced at \$50,000.

For more information, contact Stratus at 55 Fairbanks Blvd., Marlborough, Mass. 01752, or call (508) 460-2000. ☐



## Nightmare Scenario #1

# THE UNDETECTED TIME BOMB.

**The biggest networking disasters  
always start small.**

**C**hoose the wrong network and there could be dire consequences.

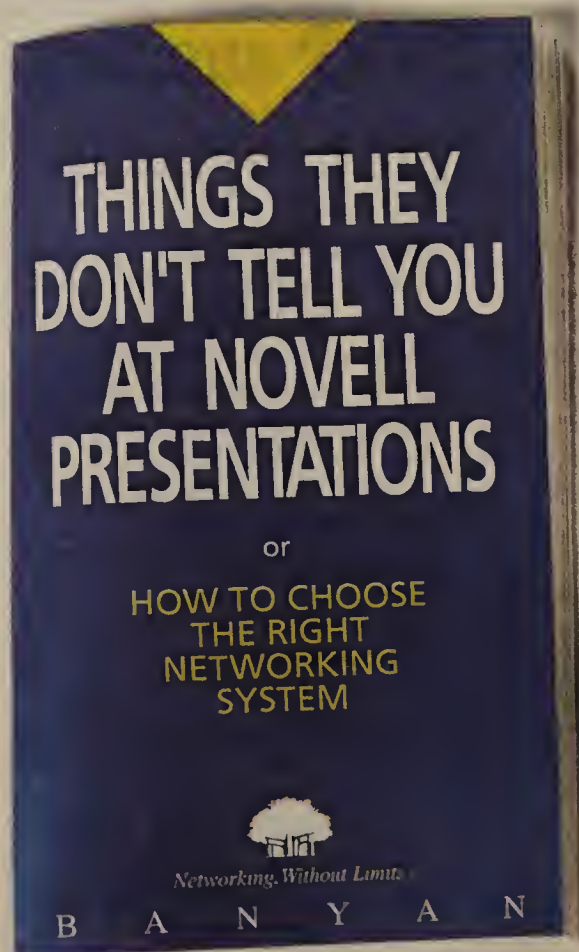
The problems begin when you need to grow.

Suddenly, the network that worked well doesn't seem to work at all.

You have to hire more network administrators. Spend more money. Retrain. Reconfigure.

And it doesn't stop. Every time you grow, even a little, your network gets harder to manage, harder to use, and harder to fund.

**Easy, economical  
growth must  
be planned in.  
It can't be  
tacked on.**



*Send for this free booklet full of hard,  
comparative information.*

There are only two ways out of this nightmare. Don't grow. Or call Banyan.

It's a question of architecture. A network such as Novell's Netware® is a loosely configured amalgamation of products, not an integrated system. Adding new users means having to update user profiles, retrain employees, and troubleshoot connectivity problems.

**O**n the other hand, there's Banyan. Our architecture is designed to grow effort-



lessly. (Ease of growth is why we're the leader in true enterprise-wide pc networking.)

Whether you're growing from 10 users to 100 or even 10,000, your Banyan VINES® *architecture stays the same.*

**T**his gives you enormous advantages. Even if your network grows to span continents, the cost of managing the network will be kept to a minimum.

---

**Banyan VINES  
can save you a  
fortune. That's  
indisputable.**

---

What's more, VINES' open, standards-based architecture allows you to adopt whatever new products come along—whether it's one of the new “super servers” or some of the thousands of network-based applications available for VINES.

And whatever your requirements—Global

Naming, Security, Global Administration, WAN interconnection, Multi-processor or Multi-lingual capability—Banyan can deliver immediately. Now.

---

**Switching over to  
VINES isn't just  
smart, it's easy.**

---

You don't have to scrap the network you have now in order to switch to VINES. We can make your transition simple and inexpensive.

Get all the facts. We have recently prepared a booklet: “THINGS THEY DON'T TELL YOU AT NOVELL PRESENTATIONS.” You'll find it a

useful source of comparative information.

**M**ore than one million people are now using Banyan VINES, in operations ranging from a handful of users to the world's largest pc-based global networks. Let us share our case studies with you.

The more you know, the more you'll want Banyan. We can simplify the use and management of your distributed network.

---

**Call  
1-800-828-2404  
for a free  
brochure.**

---

Please send this coupon to: BANYAN, 120 Flanders Road, Westboro, MA 01581

**1-800-828-2404**

NAME

TITLE

COMPANY

ADDRESS

CITY

STATE

ZIP

PHONE



**BANYAN®**  
*Networking. Without Limits.™*



# OPINIONS

## END-USER SUPPORT

BY DOUGLAS WELCH

# Documentation, training shouldn't be afterthoughts

Information services staff face constant pressure to produce results. Current logic seems to indicate that the bigger the project, the bigger the results must be. Big-money items have to be sold to upper management on the basis of cost-effectiveness and productivity gains. Everyone is anxious to show great results and gain acceptance for the next major project.

Often, however, these big-ticket items ignore a fundamental need of end users by treating important areas such as documentation and training as afterthoughts. While upper management is pleased with the completion of the project, the results may not be as rosy as they should be. The productivity gains aren't there, and the financial gains may not meet

expectations. People then point a finger at their favorite scapegoat, yet no one investigates the true cause of the failure.

Throughout many corporations, the scenario is the same. After all the technology is installed, the network group packs up and goes home. The application developers receive their slaps on the back and the project is completed. Or is it? Often the end user is left to drift through a morass of too

**I**t is time for network and support groups to stop speaking in tongues.

▲▲▲

much, too little or no documentation. Training is poorly conceived, if considered at all. After a short time, both users and management may be asking a few questions. Where is the promised productivity increase? Where is the benefit? Where did all that money go?

This problem has several solutions. First, network support and administration personnel should be included in all project teams from the onset. These people bring years of experience to the project in terms of maintenance and administration. They realize that a project never really ends, it just becomes "somebody else's problem" — usually theirs.

Second, the maintenance and support part of the system's life cycle should be considered as important as the evaluation and implementation portions. If the project can't be supported, it shouldn't be started.

Third, documentation and training costs should also be included in project budgets from the beginning. They should not be afterthoughts. Documentation should develop along with the project. Producing the documentation as the project progresses ensures accurate testing and comprehensive, clear documents and information that are specific to the company's needs. Documenters using the software will be the first to point out any inconsistency or hard-to-understand feature. If they find it hard to explain, then it is probably hard to use as well.

Finally, training should consist of more than a cursory overview of the system and a thin, obtuse manual written by a harried programmer. The target users of the project are already defined. Why not plan their training as well? Professional trainers should be provided to ensure that the system will meet everyone's expectations. These expectations can be successfully fulfilled with traditional training, half-day seminars and key-user involvement.

It is time for network and support groups to stop speaking in tongues and begin to communicate with their users. Users expect more than just a product. They expect solutions. It is up to network managers, administrators and support people to provide it.

*Welch is a support analyst for a major entertainment corporation in Los Angeles.*

## NETWORK WORLD

**Editor**  
John Gallant

**Executive Editor**  
John Dix

**Assistant Managing Editor — News**  
Charles Bruno

**Senior Editors**  
Bob Brown — Industry Update  
Barton Crockett — Global Networks  
Paul Desmond — Data Communications  
Wayne Eckerson — Management Strategies  
Bob Wallace — Telecommunications

Caryn Gillyooly — Local Networking  
5423 Gladewright Drive  
Centreville, Va. 22020  
Phone: (703) 266-1537  
Fax: (703) 266-1543

Jim Duffy — Data Communications  
115 E. 27th St., #1C  
New York, N.Y. 10016  
Phone: (212) 481-3095  
Fax: (212) 679-0147

**Staff Writers**  
Maureen Molloy — Internetworking  
Joanne Cummings

**West Coast Bureau**  
Timothy O'Brien  
Bureau Chief/Network Software  
2088 Union Street, Suite 2  
San Francisco, Calif. 94123  
Phone: (415) 771-3530  
Fax: (415) 771-2817

**Washington D.C. Bureau**  
Anita Taff — Bureau Chief  
Phone: (202) 879-6744  
  
Ellen Messmer — Correspondent  
National Place  
1331 Pennsylvania Ave. NW, Suite 505  
Washington, D.C. 20004  
Phone: (202) 879-6752

**Features Editor**  
Paul Strauss

**Managing Editor — Features**  
Jim Brown

**Associate Features Editors**  
Alison Conliffe  
Susan Collins

**Features Writer**  
Salvatore Salamone

**Design Editors**  
Susan Champeny  
Susan Slater

**Assistant Managing Editor — Production**  
Beth Khoury

**Copy Editors**  
Michelle Beaulieu  
Skip MacAskill  
Elizabeth Marshall  
Karen Moltenbrey

**Assistant to the Editor**  
Cheryl Tynan

**Editorial Assistant**  
Glenna Fasold

**Contributing Editors**  
Daniel Briere  
James Kobielus  
Alan Pearce

**Teletoons**  
Phil Frank  
Joe Troise

**President/Publisher**  
Colin B. Ungaro

**Director of Financial Operations**  
Mary Fanning

Network World, 161 Worcester Road, Framingham, Mass. 01701  
(508) 875-6400, MCI Mail — 390-4868, Fax: (508) 820-3467

## USER ADVISORY PANEL

**Laurie Bride**  
Manager, Network Architecture, Boeing Computer Services

**Roy Bruce**  
Senior Adviser, International Communications Association

**Phillip Evans**  
Director, Telecommunications, FMC Corp.  
Senior Advisor, International Communications Association

**Len Evenchik**  
Director of Communications,  
The Commonwealth of Massachusetts

**Thomas Festa**  
Communications Director, Liberty Brokerage, Inc.

**Lionel Gillerman**  
Telecommunications Services, McDonnell Douglas  
Aerospace Information Services Co.  
Vice-President for Regulatory Affairs,  
Telecommunications Association, Inc.

**E.W. Bud Huber**  
Senior Consultant, Hughes Aircraft Co.  
Chairman, User Alliance for Open Systems

**Michael Kaminski**  
Manager, CIM/Networking Technologies  
General Motors Corp.

**Michael Kilbane**  
President, International Communications Association  
General Manager of Systems Development,  
Diamond Shamrock R&M, Inc.

**Ron Kopitowsky**  
Telecommunications Director, Metropolitan  
Transportation Authority of New York State  
First Past President  
Communications Managers Association

**Donna Kwak**  
Senior Vice-President, Chase Bank of Arizona  
President, Tele-Communications Association, Inc.

**Charles Murray**  
President, Communications Managers Association  
Telecommunications Director, The Travelers Insurance Co.

**Chuck Papageorgiou**  
Network Administrator,  
United Parcel Service, Inc.

**Henry Pfendt**  
Director, Information Technology Services,  
Eastman Kodak Co.

**Kenneth Phillips**  
Vice-President, Office of Telecommunications Policy,  
Citicorp  
Chairman, Committee of Corporate  
Telecommunications Users

**William Pomeroy**  
Director of Telecommunications Public Policy,  
International Communications Association

**Richard Sidoli**  
Telecommunications Director, Morgan Stanley

**Stanley Welland**  
Manager, Corporate Telecommunications  
General Electric Co.

**Ronald West**  
President, Association of Data Communications Users  
Manager of Telecommunications and Office Automation,  
Shearman & Sterling

## EDITORIAL

# Troublesome ANI issue must be resolved by Congress

America needs to have the contentious issue of automatic number identification (ANI), which pits consumer privacy concerns against business interests, resolved by legislation. Congress, not the Federal Communications Commission, should set this national policy.

Congress' authority in this area has been clearly established in numerous Supreme Court cases that have given virtually unrestricted powers to that legislative body to overrule state regulators on matters affecting interstate commerce. But in several recent cases, the courts have ruled that the FCC must show compelling need to overrule state regulators.

Nevertheless, it was the FCC, not Congress, that received press coverage when it recently proposed the development of a national policy regulating ANI. There are bills in Congress addressing this issue, but they are

currently not considered on the congressional "fast track." They should be.

Congress and the FCC agree on the basic method of ensuring caller privacy: all carriers providing caller ID services should be required to give customers the ability to block transmission of their telephone numbers on individual calls.

Congress and the FCC also agree that ANI policy setting should not be left to the states. A national ANI policy is clearly necessary from both consumer and business perspectives. Some states may not go far enough in protecting caller privacy. Similarly, national ANI services would flounder if they were entangled in a web of differing state rules.

Providing per-call blocking seems to us to be a useful compromise between the needs of business users and the privacy concerns of individuals.

Although Congress and the FCC share these essential views, they also differ on some key points. For example, House bill H.R. 1304 requires that caller ID-blocking be offered as a free service, while the FCC is mulling the possibility of letting carriers get paid for it.

H.R. 1304 also forbids corporate users of 800 services to sell or disclose information drawn from numbers obtained through caller ID services.

Last year, President Bush said he would veto any bill containing similar provisions because he would consider them "antibusiness."

Some disagreement is inevitable, but surely excellent reasons to compromise now exist. For the sake of ANI services, the FCC and Congress should work together on new legislation that will ensure privacy in ANI services and provide a framework for regulating national ANI. □



# OPINIONS

## REGULATORY AFFAIRS

BY ALAN PEARCE

### Users won't see info services from the RBHCs this year

U.S. District Court Judge Harold Greene's July decision on information services appears to pave the way for the seven regional Bell holding companies to offer information services.

Unfortunately, users should not expect to see much action from the RBHCs in this area any time soon. Before they can roll out public network-based electronic yellow pages, video on demand, electronic messaging and transaction services such as credit verification, the RBHCs must overcome several major hurdles:

- Greene "stayed" his decision pending appeals to higher courts. This alone could result in a delay of at least one year and perhaps as many as three.

- Greene included in his 71-page opinion a scathing account of the RBHCs' alleged abuses of power. By doing this, he gave the RBHCs' opponents — the newspaper and cable television industries, the long-haul service providers, other information services and data base providers, as well as user groups — an opportunity for either the Dis-

market power that they can — and probably will — use illegally to frustrate competition and cheat telephone ratepayers. By citing past abuses, Greene attempts to bolster this theory.

- The RBHCs' opponents will now attempt to persuade Congress to pass legislation either reaffirming the information services ban in the Modified Final Judgment or alternatively continuing it until the RBHCs are subject to full competition in the provision of local telephone service.

- Once the courts and the U.S. Congress have finally spoken, the Federal Communications Commission will launch a rule making or series of rule makings designed to establish a regulatory structure for the RBHCs' information services offerings. Rule makings resulting in the development of new policy always take time. And they are themselves the subject of court appeals, sometimes going all the way to the Supreme Court. The result? Further delay.

- State regulators will also join the policy fight and attempt to assert jurisdiction over the offering of information services by local phone companies. If the RBHCs are rigidly regulated by the FCC and the states when they offer information services, while the competitors are not regulated at all, then telephone company-provided information services may be noncompetitive or — at best — only partially competitive.

Once the dust settles, the FCC will probably become the dominant regulator of the provision of information services by the RBHCs.

Current FCC policies have already opened doors and not just for RBHC entry. The agency has also set precedents on how to keep a tight regulatory rein on any inclination the RBHCs have to behave in ways that injure either users or competitors.

In addition, it's clear that the FCC will improve upon its current safeguards to assuage the

fears that the RBHCs will inhibit or foreclose competition while cheating the user.

Therefore, Greene is wrong when he says that the RBHCs have the power to foreclose competition in the provision of information services in the U.S.

But, Greene is correct when he says that the RBHCs have

**R**ule makings resulting in the development of new policy always take time.

▲▲▲

been guilty in the past of anti-competitive practices. For the most part, the FCC and the Department of Justice have been generally successful — with the help of other industry participants — in uncovering these abuses of power and punishing the RBHCs.

Greene also appears to be unaware of the power telecommunications users have. Indeed, those users are so powerful today that it is nearly impossible for any company, even the RBHCs, to exploit, cheat, overcharge or inhibit telecommunications them.

Users have been empowered by the rapid growth of competition, not only in the U.S., but increasingly throughout the world. There are viable and powerful competitors in almost every industry segment: local exchange services, long-haul services, mobile communications services and equipment manufacturing.

Against this backdrop, it is much safer today to allow RBHC entry into information services than it was 10 years ago.

Greene made the right decision. It's just too bad users won't see the benefit of it for years to come. **Z**

**G**reene included in his opinion a scathing account of the RBHCs' alleged power abuses.

▲▲▲

trict of Columbia Court of Appeals or the Supreme Court to overrule him and continue the information services prohibition on the RBHCs.

Greene's central premise regarding the RBHCs remains unchanged: He believes they have

*Pearce is president of Information Age Economics, Inc., a telecommunications research firm in Washington, D.C.*

**"WRITING, WHEN PROPERLY MANAGED,** is but a different name for conversation." Well, it's time to converse with your colleagues about networking. Write a column for *Network World*. Columns should be 600 words in length and submitted on disk, via modem or through MCI Mail at 390-4868.

If you'd like to write a column, call Alison Conliffe, associate features editor, at (508) 820-7416 or fax your idea to us at (508) 820-3467.

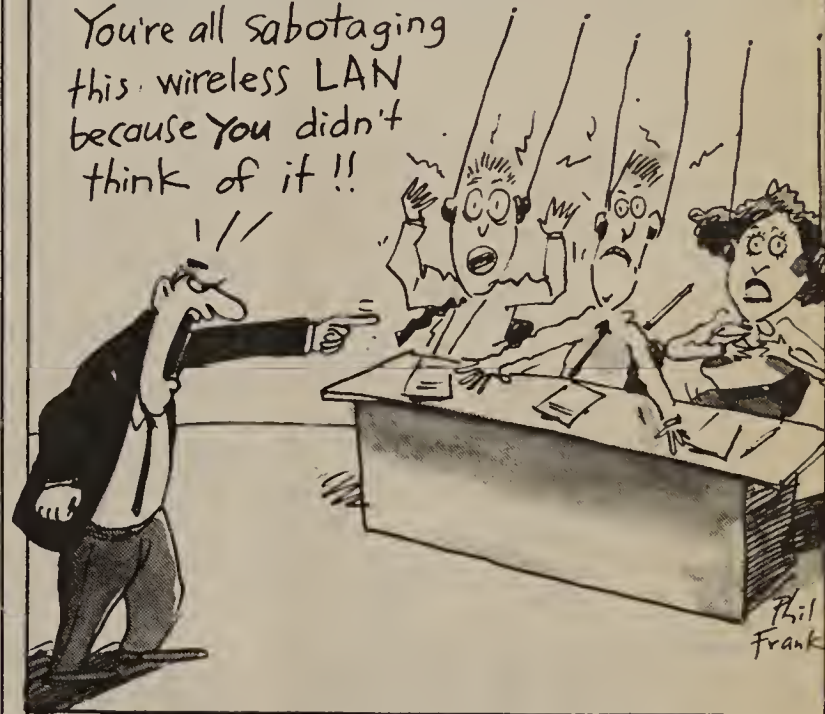
## TELETOONS

BY FRANK AND TROISE

### Network Manager's Handbook Rule 47

Do not let your desire for success affect your judgment during product trials.

Oh, cut the dramatics!!  
You're all sabotaging this wireless LAN because you didn't think of it!!



## LETTERS

### Tribute out of focus

I'm writing in response to Alan Pearce's memorial to Dean Burch ("Dean Burch: The industry owes him a debt of gratitude," *NW*, Sept. 16). Rather than being limited to an account of Burch's numerous accomplishments, the column takes cheap shots at U.S. District Court Judge Harold Greene.

The article suggests that Greene brought the 1974 anti-trust suit against the Bell system based on the theory that the Federal Communications Commission could not effectively control the Bell system's anticompetitive behavior.

However, the Department of Justice, under President Ford, brought that antitrust suit and ultimately asked for divestiture as relief. Greene simply oversaw the latter portion of the trial, approved the Justice Department's agreement with the Bell system and, as he is legally obligated to do, oversaw the resulting antitrust consent decree.

Today's FCC has the worst

record enforcing its own regulations than it has had in any recent time period. On average, a complaint filed today at the FCC will not receive a ruling until at least 1995 — far longer than it would have taken under Burch's administration.

Contrary to what the article may have readers believe, Burch and Greene had much in common. Both have served the public interest well and have shown much courage in opposing the political might of the Bell system of the 1970s and 1980s.

Roy Morris  
Director of public policy and government affairs  
Allnet Communication Services, Inc.  
Birmingham, Mich.

Network World welcomes letters from its readers.

Letters should be typed and double-spaced. Mail them to Editor, Network World, 161 Worcester Road, Framingham, Mass. 01701.

Letters may be edited for space and clarity.



# When you think

Network computing is creating new business computing solutions for the worldwide marketplace.

# network computing...

This October, network computing professionals will head for the Comdex/Fall '91 Network Computing Showcase, supported by Novell, Inc. – a dedicated exhibit at the Mirage Hotel complemented by a special Network Computing Conference.

# think NETWORK WORLD

The Network Computing Conference, sponsored exclusively by *Network World*, is a series of expert-driven sessions designed to equip network computing professionals with the latest management insights, trends and technology developments.

# at COMDEX®/Fall '91

And *Network World*, the award-winning enterprise networking newsweekly, will be available at the Comdex show. Over 12,000 copies of the October 21 issue will be distributed throughout the Network Computing Conference and Exposition. And *Network World* readers will not want to miss our October 21 special features: 1) A Buyer's Guide on Superservers and 2) Evaluating LAN Security.





**10BASE-T**

**ADAPTERS**

# Competition driving 10Base-T card prices down

By DAVID TERRIE

In 1987, when vendors started delivering products that enabled Ethernet to run over unshielded twisted-pair wire, it became clear that this technology would shake up the local-area network market. And it has. Sales of 10Base-T equipment have skyrocketed. In fact, network managers now favor it over thick or thin coaxial cable in the majority of new Ethernet installations.

Four years ago, a generation ago for the computer industry,

*Terrie is president of Newport Consulting, a Scituate, Mass.-based consulting firm specializing in strategic, competitive and product or technology analysis for local- and wide-area network hardware and software.*

many industry watchers assumed that the IBM-backed token ring (IEEE 802.5) would blow Ethernet out of the water. But with 10Base-T ruling the roost, Ethernet is more than holding its own. Demand is so strong and technical barriers to entry are so low that more than 100 vendors are plying the market with 10Base-T adapter cards.

With so many vendors manufacturing 10Base-T adapters, the

recent spate of price reductions for those products would seem to signal a price war and subsequent

## CHART • GUIDE

A Buyer's Guide chart comparing 10Base-T adapter cards begins on page 46. A guide to intelligent wiring hubs was featured in our March 11 issue.

**10Base-T users benefit from flood of vendors, reduced production costs.**

shakeout of all but the strongest players. But this is not entirely so. Overall margins with these reduced prices are probably no worse than they've been for the last few years. The bulk of the price reductions over the past year are due to the dramatically lower cost of building cards that use the newer, more highly integrated chipsets and components.

To date, price reductions are being driven by both technology and competition. At the beginning of the year, most 10Base-T adapters were priced \$50 to \$100 more than their coaxial equivalents, yet they actually cost less to make. With virtually every Ethernet adapter manufacturer offering 10Base-T cards, this premium has disappeared.

*(continued on page 44)*



(continued from page 43)

New chipsets, such as the ST-NIC from National Semiconductor Corp., are incorporating network interface controller (NIC), coder/decoder (codec) and transceiver functions into a single chip, reducing both card space and power consumption.

Virtually all adapters will sport this new level of integration

in the near future.

Of the models listed in the accompanying charts beginning on page 46, the average suggested retail price is about \$365, which translates to a street price of about \$220. Yet a few small manufacturers, such as Addtron Technology Company, Ltd., Artisoft, Inc. and Intellicom, Inc., are already offering low-end cards with

street prices in the \$100 to \$125 range.

By the end of 1992, further reduction in the size of chips integrating the NIC, codec and transceiver functions — combined with further integration of passive components — will cut overall manufacturing costs in half, resulting in even lower street prices.

This will be especially true for 16-bit cards, where the real market growth is today. Most adapter makers will roll out new models using either National Semiconductor's ST-NIC chips or similar chips from AMD Co. and others in the next few quarters, if they have not already.

The average street price for this new generation of 8-bit

10Base-T cards will be in the \$150 to \$175 range by early 1992. It is likely that 16-bit cards will cost around \$25 more. Apple Computer, Inc. Macintosh-compatible cards will follow a similar path, although low-end cards will cost roughly \$50 more, in the \$200 to \$225 range, due in large part to lower competition.

Micro Channel Architecture (MCA) and Extended Industry Standard Architecture (EISA) cards, which are primarily aimed at high-performance server applications, will cost more than 8- and 16-bit ISA cards. MCA cards come in both 16- and 32-bit flavors, and now cost about \$300 and \$425, respectively.

These prices will fall to around \$250 and \$350, respectively, in the next six months, and the 32-bit EISA card prices are likely to fall faster. Street prices for EISA cards are around \$375 today and will likely drop to around \$300 in the next six months, due to greater competition. (There are more EISA card makers than MCA card makers.)

Eventually, price reductions will slow because manufacturing, testing, marketing, packaging and distribution costs can only go down so far. In fact, the component cost of 10Base-T adapters is falling so low that prices will begin to level off within a year.

Memory costs are negligible as well because few cards have large random-access memory (RAM) packet buffers for capturing packets as they are transferred from the workstation's memory to the card (8K bytes is typical). Still, rock-bottom mail order prices for 8-bit cards may very well hit \$75 by the end of 1992.

#### Velcro hubs anyone?

Other chips are providing similar economies at the hub, where repeater function for signal regeneration is performed. Widespread use of AMD's AM79C980 Integrated Multiport Repeater (IMR) chip will cut repeater costs dramatically. Developed with Hewlett-Packard Co., which is the IMR's first user, the chip incorporates eight full 10Base-T transceivers and has an expansion port that enables multiple IMRs to behave as one.

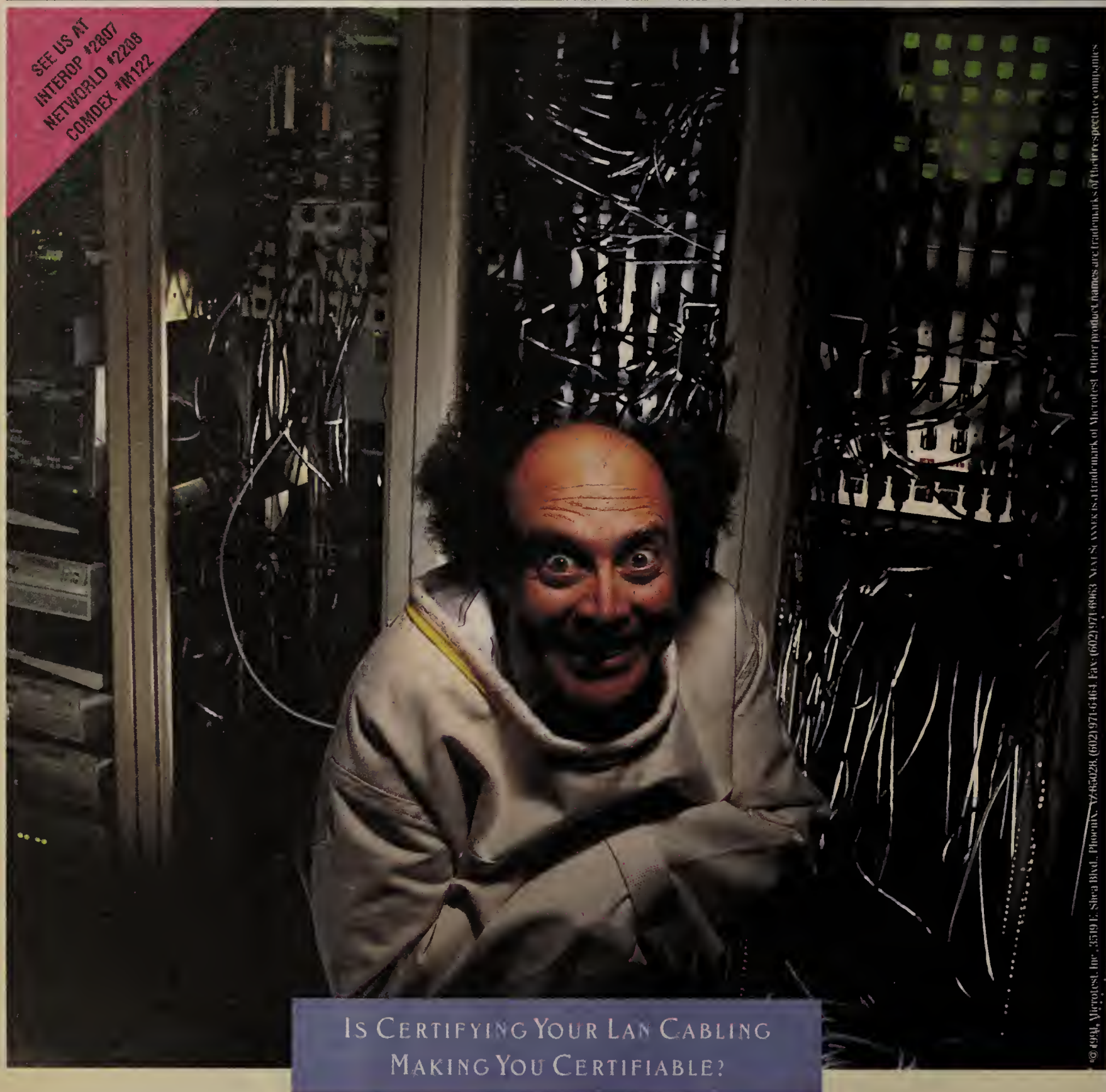
Among stand-alone hubs, street prices for low-end, 8-port models today are \$50 per port, down from \$100 at the beginning of the year. The next year will likely see even more vendors introducing low-end hubs as the high level of integration provided by the IMR chip lowers barriers to entry.

The prices for these "velcro hubs" (which can be attached to the wall with a velcro strip) will continue to drop sharply, resulting in low-end prices in the \$25 to \$35 per-port range by the end of 1992.

Some adapter cards even double as hubs, using chips such as

(continued on page 51)

SEE US AT  
 INTEROP #2807  
 NETWORK WORLD #2208  
 COMDEX #M122

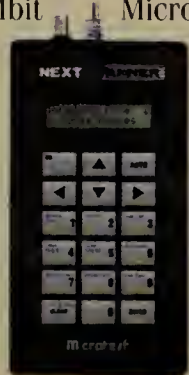


IS CERTIFYING YOUR LAN CABLING  
 MAKING YOU CERTIFIABLE?

© 1991, Microtest, Inc. 3519 E. Shea Blvd., Phoenix, AZ 85028 (602) 971-6464 Fax (602) 971-6963 N/A/S/AA/UK is a trademark of Microtest. Other product names are trademarks of their respective companies.

As networks grow larger and more complex, so does the job of installing and managing them. It just might be enough to drive you over the edge. ⚡ That's where Microtest's NEXT SCANNER comes in. It makes you an instant expert. ⚡ NEXT SCANNER knows which tests to run to certify new or existing wiring. Simply select your network type—10Base-T, 4/16 Mbit token ring, ETHERNET or ARCNET; and the cable type—UTP, STP or coax. Then press "Autotest." ⚡ NEXT SCANNER automatically selects and runs the appropriate tests for your network. So you don't have to worry about near end crosstalk (NEXT), length, attenuation, resistance, noise or even which wire goes where. ⚡ Then it analyzes the data and reports any out-of-spec errors. It even tells you

the best pairs of wires to use for data transmission. You can then print certification reports or download test results to the optional Cable Management System. ⚡ The NEXT SCANNER has flash memory, so you can instantly add optional upgrades or enhancements anywhere there's a PC and a modem, by using Microtest's EXTEND™ system. ⚡ And of course, NEXT SCANNER's powerful TDR capabilities pinpoint cabling problems quickly and easily, minimizing network downtime. ⚡ So, if you're looking for a better way to troubleshoot and certify your network cabling, that saves time, money and maybe even your sanity, call Microtest. We'll show you what's NEXT. Be sure to ask for your free LAN Troubleshooting Guide.



**Microtest**  
 Innovative LAN Solutions  
 800-526-9675

Circle Reader Service #127



Issue date    October 7, 1991

Card must be received by    January 31, 1992

Name	
Title	
Company	
Street	
City	
State	Zip
Phone	Fax

URGENT

1. Action requested

- ☐ Request for sales call
- ☐ Request for proposal
- ☐ Request for information

3. Scope of purchase responsibility

- ☒ Enterprise wide
- ☐ Departmental

2. Purchase timeframe

- ☐ Within 60 days
- ☐ Within six months
- ☐ Within one year

4. Purchase influence/number of sites

- ☐ One site
- ☐ 2-9 sites
- ☐ 10-20 sites
- ☐ 21+ sites

101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150

Issue date    October 7, 1991

Card must be received by    January 31, 1992

Name	
Title	
Company	
Street	
City	
State	Zip
Phone	Fax

URGENT

1. Action requested

- ☐ Request for sales call
- ☐ Request for proposal
- ☐ Request for information

3. Scope of purchase responsibility

- ☐ Enterprise wide
- ☐ Departmental

2. Purchase timeframe

- ☐ Within 60 days
- ☐ Within six months
- ☐ Within one year

4. Purchase influence/number of sites

- ☐ One site
- ☐ 2-9 sites
- ☐ 10-20 sites
- ☐ 21+ sites

101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150





NO POSTAGE  
NECESSARY  
IF MAILED  
IN THE  
UNITED STATES

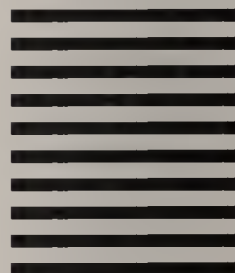
**BUSINESS REPLY MAIL**

FIRST CLASS PERMIT NO.716 PITTSFIELD, MA

POSTAGE PAID BY ADDRESSEE



The Newsworthy of Enterprise Networking Strategies



P.O. Box 5090  
Pittsfield, MA 01203-9838



NO POSTAGE  
NECESSARY  
IF MAILED  
IN THE  
UNITED STATES

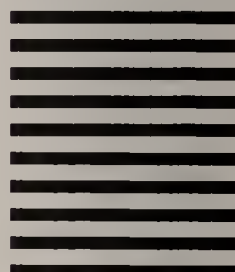
**BUSINESS REPLY MAIL**

FIRST CLASS PERMIT NO.716 PITTSFIELD, MA

POSTAGE PAID BY ADDRESSEE



The Newsworthy of Enterprise Networking Strategies



P.O. Box 5090  
Pittsfield, MA 01203-9838





# Free Information for Readers of **NETWORK WORLD**



Want more information about advertisers in this issue? If so . . .

1. Review the list of advertisers below.
2. Circle the corresponding number on the postage-paid lead service card, complete the necessary information and drop in the mail.



## ► Advertisised Products and Services

**RS#..... ADVERTISER**

101.....BBN  
102..... Black Box Corp.  
103..... Bytex  
104..... Cabletron  
105.....Xyplex  
106.....Chipcom  
107..... Codex  
108.....Digital Access Corp  
109..... Dowty Communications  
110..... Dupont  
111..... Hughes Communications  
112.....Microcom  
113.....L+N Technologies  
114..... Scitec  
115..... Anco  
116..... Wellfleet  
117..... WorldCom  
118.....ACC

**RS#..... ADVERTISER**

119..... Ameritech  
120..... AT&T Tridom  
121..... California Microwave  
122.....Zenith Data Systems  
123.....Fibermux  
124..... Gandalf  
125.....Hewlett-Packard  
126..... Kalpana  
127..... Microtest  
128.....Stratacom  
129.....Telebit  
130..... Ungermann-Bass  
131..... CXR/Digilog  
132..... Opcom  
133.....GTE Spacenet  
134..... Lexcel  
135..... Novell LANalyzer  
136.....NCR



## 10Base-T adapter cards (continued on page 50)

Company	Product	System and bus	8-, 18- or 32-bit	Architecture	Drivers	Management	Diagnostics	Connections	Other features	Price/warranty	Distribution
Accton Technology Corp. Fremont, Calif. (415) 226-9800	EtherPair-8T	Any PC; ISA bus; half-slot	8-bit	8K-byte RAM packet buffer	Drivers supplied for most popular NOSs	None	Installation diagnostics software	RJ-45, AUI	Selectable interrupts, I/O address and boot ROM address; Novell, Inc. NE1000-compatible	\$285/Lifetime	Distributors
	EtherPair-8WB	Any PC; ISA bus; half-slot	8-bit	8K- or 32K-byte RAM packet buffer; optional 16K-, 32K- or 64K-byte boot ROM	Drivers supplied for most popular NOSs	None	Installation diagnostics software; LEDs for link integrity and jabber	RJ-45, AUI	Selectable interrupts, I/O address and boot ROM address; Western Digital Corp. EtherCard Plus TP-compatible	\$295/Lifetime	Distributors
	EtherPair-16N	Any PC; ISA bus; half-slot	8- or 16-bit	16K-byte RAM packet buffer; optional boot ROM	Drivers supplied for most popular NOSs	None	Installation diagnostics software; LEDs for link integrity and jabber	RJ-45, AUI	Selectable interrupts, I/O address, boot ROM address; NE2000-compatible	\$325/Lifetime	Distributors
	EtherPair-HP	Any PC; ISA bus; half-slot	8- or 16-bit	64K-byte RAM packet buffer; optional boot ROM	Drivers supplied for most popular NOSs	None	Installation diagnostics software; LEDs for link integrity and jabber	RJ-45, AUI	Selectable interrupts, I/O address, boot ROM address; designed for high-performance applications	\$365/Lifetime	Distributors
	EtherPair-NE2	IBM PS/2s and compatibles with MCA; full-slot	16-bit	16K-byte RAM packet buffer; optional 16K-byte boot ROM	Drivers supplied for most popular NOSs	None	Installation diagnostics software; LEDs for link integrity and jabber	RJ-45, AUI	Selectable interrupts, I/O address, boot ROM address; Novell NE/2-compatible	\$375/Lifetime	Distributors
	EtherPocket-10T	Any PC with parallel port	8-bit	On-board processor	Drivers supplied for most popular NOSs	None	Installation diagnostics software; LEDs for link integrity and jabber	RJ-45	Selectable interrupts, I/O address, boot ROM address; NE/2-compatible	\$399/Lifetime	Distributors
Addtron Technology Company, Ltd. Fremont, Calif. (415) 770-0120	ET-100TP	Any PC; ISA bus; half-slot	8-bit	8K-byte RAM buffer; 8K-byte RAM boot PROM; no on-board processor	Novell NetWare supplied for NE1000	Link integrity test	Transmit, receive, jabber and collision LEDs	RJ-45, AUI	Selectable interrupt, I/O and PROM address; extended distances	\$195/2 years; all return cards replaced	Authorized distributors
	ET-200TP	IBM PC ATs and above; ISA bus; full-slot	16-bit	8K-byte RAM buffer; 8K-byte RAM boot PROM; no on-board processor	NetWare supplied for NE1000	Link integrity test	Transmit, receive, jabber and collision LEDs	RJ-45, AUI	Selectable interrupt, I/O and PROM address; extended distances	\$219/2 years; all return cards replaced	Authorized distributors
ADI Systems, Inc. San Jose, Calif. (408) 944-0100	Aquila AQ-E8-TP	Any PCs; ISA bus; half-slot	8-bit	Has optional boot PROM	Multiple drivers supplied (ODI, IPX, NETBIOS and packet drivers)	Via SNMP agent	Not specified	RJ-45	Supports AT&T Starlan 10 hubs (pre-10Base-T)	\$299/5 years	Distributors, system integrators
Advanced Data Products, Inc. Gaithersburg, Md. (800) 676-2744	Aquila AQ-E16-TP	PC ATs and above; ISA bus; half-slot	16-bit	Has optional boot PROM	Multiple drivers supplied (ODI, IPX, NETBIOS and packet drivers)	Via SNMP agent	Not specified	RJ-45	Supports Starlan 10 hubs (pre-10Base-T); NE2000-compatible	\$349/5 years	Distributors, system integrators
Advanced Digital Corp. Huntington Beach, Calif. (714) 891-4004	Aquila AQ-EMC-TP	PS/2s and compatibles with MCA; full-slot	16-bit	Has optional boot PROM	Multiple drivers supplied (ODI, IPX, NETBIOS and packet drivers)	Via SNMP agent	Not specified	RJ-45	Supports Starlan 10 hubs (pre-10Base-T); NE2000-compatible	\$359/5 years	Distributors, system integrators
	Aquila AQ-EISA	EISA bus computers; full-slot	32-bit	Has optional boot PROM	Multiple drivers supplied (ODI, IPX, NETBIOS and packet drivers)	Via SNMP agent	Not specified	RJ-45, AUI, BNC	Supports Starlan 10 hubs (pre-10Base-T); NE2000-compatible	\$499/5 years	Distributors, system integrators
Artisoft, Inc. Tucson, Ariz. (602) 293-6363	AE-3 Ethernet Adapter	Any PC; ISA bus; full-slot	8-bit	16K-byte RAM buffer upgradable to 64K-byte; optional configurable boot ROM	Not supplied; compatible with Novell NE2000 drivers	None	Not specified	RJ-45, AUI	Supports multiple DMA channels, I/O and interrupt addresses	\$349/30-day money back guarantee; 5 years	Unspecified distributors
	AE-3 Ethernet MicroChannel Adapter	PS/2 compatibles with MCA	16-bit	16K-byte RAM buffer upgradable to 64K-byte; optional configurable boot ROM	Not supplied; compatible with NE2000 drivers	None	Not specified	RJ-45, AUI	Supports multiple DMA channels, I/O and interrupt addresses	\$449/30-day money back guarantee; 5 years	Unspecified distributors
	AE-2/T Ethernet Adapter	Any PC; ISA bus; full-slot	8- or 16-bit	16K-byte RAM buffer upgradable to 64K-byte; optional configurable boot ROM	Not supplied; compatible with NE2000 drivers	None	Not specified	RJ-45, AUI	Supports multiple DMA channels, I/O and interrupt addresses	\$299/30-day money back guarantee; 5 years	Unspecified distributors
	AE-2/T MicroChannel Adapter	PS/2s with MCA; full-slot	8- or 16-bit	16K-byte RAM buffer upgradable to 64K bytes; optional configurable boot ROM	Not supplied; compatible with NE2000 drivers	None	Not specified	RJ-45, AUI	Supports multiple DMA channels, I/O and interrupt addresses	\$399/30-day money back guarantee; 5 years	Unspecified distributors
	AE-1/T Ethernet Adapter	Any PC	8-bit	8K-byte RAM buffer; optional configurable boot ROM	Not supplied; compatible with NE1000 drivers	None	LED for link integrity	RJ-45	Supports multiple I/O and interrupt addresses	\$199/30-day money back guarantee; 5 years	Unspecified distributors
Asante Technologies, Inc. Sunnyvale, Calif. (408) 752-8388	MacCon + IIET	Apple Computer, Inc. Macintosh II family; NuBus; full-slot	32-bit	16K-byte RAM buffer upgradable to 64K bytes	Asante's Ethernalk, Apple's AppleShare, Sitka Corp.'s TOPS, NetWare, 3Com Corp.'s 3+Open, Digital Equipment Corp.'s DECnet, TCP/IP	None	Neon Software's Netminder diagnostic tools	RJ-45, AUI	System 7.0-compatible	\$299/5 years, 100% repair or replacement	Ingram Micro, Merisel/Macamerica, Tech Data Corp.
	MacCon + 30IET	Macintosh SE/30 and IIsi; 32-bit 68030 PDS	32-bit	Macintosh IIsi cards have socket for math coprocessor	Ethernalk, AppleShare, TOPS, NetWare, 3+Open, DECnet, TCP/IP	None	Netminder diagnostic tools	RJ-45, AUI	System 7.0-compatible; Macintosh IIsi cards enable second card to share slot	\$299/5 years, 100% repair or replacement	Ingram Micro, Merisel/Macamerica, Tech Data

AFP = AppleTalk File Protocol  
 AUI = Attachment unit interface  
 DMA = Direct memory access  
 EEPROM = Electrically erasable programmable read-only memory  
 EISA = Extended Industry Standard Architecture  
 FPC = Floating-point coprocessor  
 FPU = Floating-point unit

IPX = Internetwork Packet Exchange  
 ISA = Industry Standard Architecture  
 MCA = Micro Channel Architecture  
 NCP = Novell's NetWare Core Protocol  
 NDIS = Microsoft's Network Driver Interface Specification  
 NIC = Network interface card  
 NOS = Network operating system

ODI = Open Data-Link Interface  
 PC-NFS = Sun's Personal Computer-Network File System  
 PDS = Processor direct slot  
 PROM = Programmable read-only memory  
 SCSI = Small Computer System Interface  
 SNMP = Simple Network Management Protocol  
 VAR = Value-added reseller

This chart includes a representative selection of 10Base-T adapter cards. These vendors may offer other adapter cards, and other vendors not included may offer a full range of products.

SOURCE: NEWPORT CONSULTING, SCITUATE, MASS.



# Some merely run. Others go beyond.



Running a network takes more than just powerful hardware. To run the best you can, you need an operating system that takes full advantage of all that networking has to offer. That's what IBM OS/2® does.

Whether it's LAN or enterprise-wide connectivity, OS/2 can meet your needs right from the start and in the long run as well. OS/2 was designed for networking, and Extended Edition gives you even more, like integrated communications, database and LAN solutions, as well as access to Ethernet™, Token-Ring and more. With "crash" protection, if one OS/2 application fails, there's no need to reboot, reconnect or reconfigure. OS/2 also features true multitasking—you can work with business applications while your network sessions continue to send and receive information. And the next version, OS/2 2.0, will soon make even greater strides. It's being designed to provide access to applications created for DOS, Windows™ and OS/2—giving you thousands of solutions on a full, rich client platform.

Act now and you can start with OS/2 1.3 SE for just \$99, if you own IBM DOS; \$150 otherwise.\* Or get OS/2 1.3 EE for \$635, if you own IBM DOS; \$690 otherwise. In either case, you'll be able to get an upgrade to OS/2 2.0 upon release at no extra charge. To order OS/2 1.3, call 1 800 342-6672,\*\* or contact your IBM Authorized Remarketer or IBM marketing representative. And start running better than ever.



\*IBM DOS to OS/2 upgrade offer is good through 12/31/91. \*\*In Canada call 1 800 465-1234. IBM and OS/2 are registered trademarks of International Business Machines Corporation. Ethernet is a trademark of XEROX Corporation. Windows is a trademark of Microsoft Corporation. © 1991 IBM Corp.



# The right environment inspires great pitching.



The crackling excitement of a sellout crowd. The exquisite tension of a hitting streak on the line. The pressure building relentlessly as the count goes 3 and 2. This is the All-Star Game. Where talent rises to the occasion.

Exceptional performances are what the Enterprise Technology Center is all about. It's where your products play on a team with the latest high performance

hardware, software and systems from the country's leading marketers. Cheered on by serious buyers of networking and systems integration products.

At the ETC, your products are fully integrated in multi-vendor, multi-platform solutions in an objective, independent environment. And your performances judged by the ETC's corporate membership. These leading Fortune 500

companies use the Center as a test and evaluation facility, so make an outstanding play and you could be well on your way to a high paying, multi-year contract.

Innovative marketers count on the ETC to provide an impartial, independent, cost-effective showcase for their latest technologies in action. It brings prime prospects together in an attractive environment, conducive to resolving





the many technical obstacles common to closing enterprise-wide and multi-vendor system sales.

But access to leading customers is just one reason to become an ETC sponsor. State-of-the-art facilities and an outstanding professional staff make the ETC an ideal setting for product introductions, media events, seminars and training—even beta and contract testing.

If issues such as interoperability, client-server computing, connectivity, enterprise-wide networks, cooperative processing, and downsizing are critical to your marketing program, call Mike Culp, Manager of the Enterprise Technology Center, at (800) 950-5267 now. He'll put you in the starting lineup with the computer industry's leading marketers.



The Premier Systems Integration Showcase.

See ETC integration at NETWORLD Booth 2033.



## NETWORK WORLD

## 10Base-T adapter cards (continued on page 54)

Company	Product	System and bus	8-, 16- or 32-bit	Architecture	Drivers	Management	Diagnostics	Connections	Other features	Price/warranty	Distribution
Asante (continued)	MacCon+ LC	Macintosh LC	16-bit	Macintosh LC cards have socket for math coprocessor	EtherTalk, AppleShare, TOPS, NetWare, 3+ Open, DECnet, TCP/IP	None	Netminder diagnostic tools	RJ-45, AUI	System 7.0-compatible	\$299/5 years, 100% repair or replacement	Ingram Micro, Merisel/Macamerica, Tech Data
	MacCon+ SEET	Macintosh SE	8-bit	16K-byte RAM buffer upgradable to 64K bytes	EtherTalk, AppleShare, TOPS, NetWare, 3+ Open, DECnet, TCP/IP	None	Netminder diagnostic tools	RJ-45, AUI	System 7.0-compatible	\$299/5 years, 100% repair or replacement	Ingram Micro, Merisel/Macamerica, Tech Data
	MacCon3 for Nubus	Macintosh II (except Macintosh IIsi);	32-bit	64K-byte RAM packet buffer standard	EtherTalk, AppleShare, TOPS, NetWare, 3+ Open, DECnet, TCP/IP	None	Netminder diagnostic tools	RJ-45, AUI	Autoconfiguration for all media types; System 7.0-compatible	\$399/5 years, 100% repair or replacement	Ingram Micro, Merisel/Macamerica, Tech Data
	MacCon3 for SE	Macintosh SE	8-bit	64K-byte RAM packet buffer standard	EtherTalk, AppleShare, TOPS, NetWare, 3+ Open, DECnet, TCP/IP	None	Netminder diagnostic tools	RJ-45, AUI	Autoconfiguration for all media types; System 7.0-compatible	\$399/5 years, 100% repair or replacement	Ingram Micro, Merisel/Macamerica, Tech Data
	MacCon3 for IIsi	Macintosh IIsi and SE/30	32-bit	64K-byte RAM packet buffer standard	EtherTalk, AppleShare, TOPS, NetWare, 3+ Open, DECnet, TCP/IP	None	Netminder diagnostic tools	RJ-45, AUI	Autoconfiguration for all media types; System 7.0-compatible	\$429/5 years, 100% repair or replacement	Ingram Micro, Merisel/Macamerica, Tech Data
AT&T Computer Systems Morristown, N.J. (800) 247-1212	2610-110 StarLAN 10 NAU	Any PC; ISA bus; full-slot	8-bit	Shared memory	NDIS and Unix drivers supplied with Microsoft Corp.'s LAN Manager software; others unspecified	None	Not specified	RJ-45	Can disable link integrity to work with pre-10Base-T hubs	\$445/3 years	Direct and through VARs
	2614-116 StarLAN EISA NAU	PC AT/EISA bus PCs; full-size	32-bit	Shared memory; optional boot PROM	NDIS and Unix drivers supplied with LAN Manager software; others unspecified	None	Not specified	RJ-45	Can disable link integrity to work with pre-10Base-T hubs; supports extended distances	\$695/3 years	Direct and through VARs
Cabletron Systems, Inc. Rochester, N.H. (603) 332-6400	E1010	Any PC; ISA bus	8-bit	8K-byte RAM packet buffer; shared memory; optional boot PROM	NetWare 2.x, 3.x, NDIS and ODI; DECnet	SNMP at hub; planned for adapters soon	4 LEDs for activity, link integrity and jabber	RJ-45, AUI	None specified	\$395/90 days	Direct; a few limited resellers
	E1010-X	Any PC; ISA bus	8-bit	32K-byte RAM packet buffer; shared memory; optional boot PROM	NetWare 2.x, 3.x, NDIS and ODI; DECnet	SNMP at hub; planned for adapters soon	4 LEDs for activity, link integrity and jabber	RJ-45, AUI	None specified	\$449/90 days	Direct; a few limited resellers
	E4010	Macintosh SE	16-bit	16K-byte RAM packet buffer	NetWare 2.x, 3.x, NDIS and ODI; DECnet	SNMP at hub; planned for adapters soon	4 LEDs for activity, link integrity and jabber	RJ-45	None specified	\$699/90 days	Direct; a few limited resellers
	E4010-X	Macintosh SE	16-bit	64K-byte RAM packet buffer	NetWare 2.x, 3.x, NDIS and ODI; DECnet	SNMP at hub; planned for adapters soon	4 LEDs for activity, link integrity, jabber	RJ-45	None specified	\$749/90 days	Direct; a few limited resellers
	E5010	Macintosh SE/30	16-bit	16K-byte RAM packet buffer	NetWare 2.x, 3.x, NDIS and ODI; DECnet	SNMP at hub; planned for adapters soon	4 LEDs for activity, link integrity and jabber	RJ-45	None specified	\$699/90 days	Direct; a few limited resellers
	E5010-X	Macintosh SE/30	16-bit	64K-byte RAM packet buffer	NetWare 2.x, 3.x, NDIS and ODI; DECnet	SNMP at hub; planned for adapters soon	4 LEDs for activity, link integrity and jabber	RJ-45	None specified	\$749/90 days	Direct; a few limited resellers
CNet Technology, Inc. San Jose, Calif. (408) 954-8000	CN500ET	Any PC; ISA bus; half-slot	8-bit	Programmed I/O memory access; optional Novell boot PROM	Supplied for NetWare LANs; IPX and ODI supported	None	Not specified	RJ-45	NE1000-compatible; supports pre-10Base-T hubs from SynOptics Communications, Inc.	\$259/5 years	Regional and national distributors (Tech Data, PC Distributing, Inc., Southern Electronics Distributors)
	CN600ET	PC ATs and above; ISA bus; half-slot	16-bit	Programmed I/O memory access; optional Novell boot PROM	Supplied for NetWare LANs; IPX and ODI supported	None	Not specified	RJ-45	NE2000-compatible; supports pre-10Base-T hubs from SynOptics	\$289/5 years	Regional and national distributors (Tech Data, PC Distributing, Southern Electronics Distributors)
	CN700ET	Any PC; ISA bus; half-slot	8-bit	Programmed I/O memory access; optional Novell boot PROM	Supplied for NetWare LANs; IPX and ODI supported	None	Not specified	RJ-45	Western Digital 8003-compatible; supports pre-10Base-T hubs from SynOptics	\$259/5 years	Regional and national distributors (Tech Data, PC Distributing, Southern Electronics Distributors)
	CN800ET	PC ATs and above; ISA bus; 2/3-slot	16-bit	Shared memory	Supplied for NetWare LANs; IPX and ODI supported	None	Not specified	RJ-45	Western Digital 8013-compatible; supports pre-10Base-T hubs from SynOptics	\$289/5 years	Regional and national distributors (Tech Data, PC Distributing, Southern Electronics Distributors)
	CN800E/2	PS/2s and compatibles with MCA	16-bit	Shared memory	Supplied for NetWare LANs; IPX and ODI supported	None	Not specified	RJ-45	Supports pre-10Base-T hubs from SynOptics	\$349/5 years	Regional and national distributors (Tech Data, PC Distributing, Southern Electronics Distributors)
	CN950E	Any PC with EISA bus	32-bit	Shared memory	Supplied for NetWare LANs; IPX and ODI supported	None	Not specified	RJ-45, AUI, BNC	Supports pre-10Base-T hubs from SynOptics	\$599/5 years	Regional and national distributors (Tech Data, PC Distributing, Southern Electronics Distributors)
	CN50ET	Any PC with parallel ports	8-bit	Shared memory	Supplied for NetWare LANs; IPX and ODI supported	None	Not specified	RJ-45	Supports pre-10Base-T hubs from SynOptics	\$399/5 years	Regional and national distributors (Tech Data, PC Distributing, Southern Electronics Distributors)

AFP = AppleTalk File Protocol  
 AUI = Attachment unit interface  
 DMA = Direct memory access  
 EEPROM = Electrically erasable programmable read-only memory  
 EISA = Extended Industry Standard Architecture  
 FPC = Floating-point coprocessor  
 FPU = Floating-point unit

IPX = Internetwork Packet Exchange  
 ISA = Industry Standard Architecture  
 MCA = Micro Channel Architecture  
 NCP = Novell's NetWare Core Protocol  
 NDIS = Microsoft's Network Driver Interface Specification  
 NIC = Network interface card  
 NOS = Network operating system

ODI = Open Data-Link Interface  
 PC-NFS = Sun's Personal Computer-Network File System  
 PDS = Processor direct slot  
 PROM = Programmable read-only memory  
 SCSI = Small Computer System Interface  
 SNMP = Simple Network Management Protocol  
 VAR = Value-added reseller

This chart includes a representative selection of 10Base-T adapter cards. These vendors may offer other adapter cards, and other vendors not included may offer a full range of products.

SOURCE: NEWPORT CONSULTING, SCITUATE, MASS



(continued from page 44)

the IMR to incorporate the repeater function. A total of five ports is the norm (the internal adapter plus four RJ-45 jacks), as this is the maximum number of RJ-45 jacks that can fit in a personal computer's expansion slot.

These hybrid products leverage the microcomputer's chassis, power supply and processor to achieve very low per-port costs. For example, Gateway Communications, Inc.'s G/Ethertwist Hub Adapter lists for \$495 and can probably be purchased for around \$300.

Assuming the adapter portion of the card would cost about \$175, the buyer is getting a five-port hub for \$125, or \$25 per port. Add \$175 per adapter for the other adapter cards attached to the hub jacks, and the total cost for a five-port 10Base-T network rises to only \$1,000, or \$200 per port. Two hub expansion cards can add four ports each, for a total of 13 ports.

D-Link Systems, Inc. offers a similar product at the same price.

#### Not a panacea

Rapidly declining costs and excellent performance will keep demand high for 10Base-T products. Yet, as popular as these products are, they are not a panacea for users. They have some drawbacks. For example, if technicians installing new 10Base-T wiring aren't careful, they can easily reverse the polarity of the connections to the RJ-45 jack.

What's more, there could be problems with installed wiring. Though the 10Base-T test that accompanies this Buyer's Guide (see "Examining what the cards say," page 71) demonstrates that most 10Base-T cards can work with wiring considerably below the specification's mandated wire grade (Level 3 wiring), some installed wiring may be so old and in such poor condition that it will not support the specification's transmission distance of up to 100 meters — if it supports LAN traffic at all.

In addition, many users still have Ethernet-over-twisted pair products that were released before the 10Base-T specification was finalized. Although many 10Base-T cards are compatible with these hubs, not all are. Conversely, some newer hubs may not support pre-10Base-T cards from certain manufacturers. Finally, network management of 10Base-T products, while widely available, is now largely based on proprietary schemes.

However, none of these problems is insurmountable. It is a matter of what you see when you look at the 10Base-T water glass. In sum, 10Base-T is far better than coaxial solutions, whether using a bus or star topology. 10Base-T LANs have introduced no truly significant problems, and they have mitigated or solved many existing ones.

In addition to being generally less expensive to install than a coaxial cabled bus topology, 10Base-T's star topology can save users with large Ethernet networks thousands of dollars a year in moves and changes. This is because it enables moves to be made via patch cables in the wiring closet instead of by either tapping into the nearest point on the

coaxial bus or pulling new cable. 10Base-T is also much less expensive than token-ring technology and should remain so. The cup may not runneth over, but it is nearly full.

#### SNMP agents taking over

The second caveat is that the hub vendors that offer network management at the adapter level

have implemented proprietary schemes. To be fair, at the time these schemes were devised, Simple Network Management Protocol (SNMP) was not the front-runner it is today.

However, all the major 10Base-T hub vendors are working on SNMP versions of their hub management products to enable users to migrate to the standard

smoothly. Adapter manufacturers are doing the same. Implementing an SNMP agent for a DOS client with a 10Base-T card takes between 20K and 50K bytes of code (written in C programming language), depending on the implementation.

The good news is that this is not a great deal of extra memory (continued on page 60)

## Black Box Opens The World Of Connectivity.



- Over 6000 Quality Product Solutions
- 60-Day Evaluations
- Long-Term Warranties
- Same-Day Shipment
- Money-Back Guarantees
- Free 24-Hour Expert Technical Support

**Call for a free catalog and pocket glossary.**

**800-552-6816**

**BLACK BOX®**



THE SOURCE FOR CONNECTIVITY<sup>SM</sup>





*Doubt has an office. Anxiety has a key to the  
Ambition and a lunch date with Paranoia. And me,  
our PBX works as consistently as the tides. And just as  
who just happens to be passing by my office at this  
That ring is a chorus of thousands of AT&T workers  
was a peerless decision...." And as the phone rings  
residual value in the industry. It's ready to grow like  
maintenance program unequaled...." But Blame  
looking for some other doorway to darken. Just as  
asking me if I had lunch plans.*





*washroom. Insecurity has a stack of messages from  
I'm staring at my telephone celebrating the fact that  
I'm doing this my phone rings, and I say to Blame,  
time, I say, "Blame, you know what that ring is?  
reminding me that buying their **DEFINITY**® System  
again I say, "Blame, this system has the highest  
flowers in springtime and is supported by a  
didn't hear this last part, as he was down the hall  
well though, it was Advancement on the phone*



**AT&T**

The right choice.



## 10Base-T adapter cards (continued on page 56)

Company	Product	System and bus	8-, 16- or 32-bit	Architecture	Drivers	Management	Diagnostics	Connections	Other features	Price/warranty	Distribution
Cogent Data Technologies, Inc. Friday Harbor, Wash. (206) 378-2929	EMaster I-AT/TP	PC ATs and above; ISA bus; ¾-slot	16-bit	Employs proprietary bus mastering technology; optional boot PROM	Cogent's drivers support most popular NOSs and Unix streams	None	Not specified	RJ-45, AUI	Has multithreaded drivers for very high performance	\$395/1 year parts and labor	OEMs, distributors and VARs
	EMaster II-AT/TP	PC ATs and above; ISA bus; ¾-slot	16-bit	Bus mastering enables 3 cards in server to triple performance	Cogent's drivers support most popular NOSs and Unix streams	None	Not specified	RJ-45, AUI	Has multithreaded drivers for very high performance	\$595/1 year parts and labor	OEMs, distributors and VARs
	EMaster III-MCA	PS/2s with MCA; full-slot	32-bit	Bus mastering enables up to 7 cards per server for extremely high performance	Cogent's drivers support most popular NOSs and Unix streams	None	Not specified	RJ-45, AUI	Has multithreaded drivers for very high performance	\$695/1 year parts and labor	OEMs, distributors and VARs
Compatible Systems Corp. Boulder, Colo. (303) 444-9532	Ether+SCSI Twisted Pair	Any Macintosh with SCSI ports	16-bit	Not specified	Supplied; supports all popular environments, including NetWare and AppleShare	Software supplied for statistics on performance and diagnostic	LEDs for power, configuration, diagnostics and activity	DB-25 or SCSI	None specified	\$495/1 year	Dealers and direct
	Ether2 Twisted Pair	Macintosh II family with NuBus	16-bit	16K-byte packet buffer upgradable to 64K bytes	Supplied; supports all popular environments, including NetWare and AppleShare	Software supplied for statistics on performance and diagnostics	LEDs for power, configuration, diagnostics and activity	RJ-45, AUI	None specified	\$395/1 year	Dealers and direct
	Ether-DS Twisted Pair	Macintosh IIsi and SE/30; PDS; half-slot	16-bit	16K-byte packet buffer	Supplied; supports all popular environments, including NetWare and AppleShare	Software supplied for statistics on performance and diagnostics	LEDs for power, configuration, diagnostics and activity	RJ-45, AUI	None specified	\$395/1 year	Dealers and direct
Compex, Inc. Anaheim, Calif. (714) 630-7302	ENET-TP/16	PC ATs and above; ISA; full-slot	16-bit	Memory mapped I/O; 64K-byte RAM packet buffer that maps into 8K-byte memory space	Compex for NetWare; third-party NETBIOS	None	Not specified	RJ-45, AUI	Supports Starlan hubs; has surge protection circuit	\$249/5-year replacement	Via unspecified distributors
	ENET-U/16-TP	PC ATs and above; ISA; full-slot	16-bit	Memory mapped I/O; 64K-byte RAM packet buffer that maps into 8K-byte memory space	Novell NE Series- and Western Digital-compatible	None	Not specified	RJ-45, AUI	Supports Starlan hubs; has surge protection circuit	\$199/5-year replacement	Via unspecified distributors
Comware Corp. Austin, Texas (512) 244-1282	EMT-608	Any PC; ISA bus; half-slot	8-bit	Not specified	Compatible with Western Digital 8003 driver but not supplied	None	Not specified	RJ-45	None specified	\$249/Not specified	Resellers
	EMT-616	PC ATs and above; ISA bus; half-slot	16-bit	Not specified	Compatible with Western Digital 8003 driver but not supplied	None	Not specified	RJ-45	None specified	\$299/Not specified	Resellers
D-Link Systems, Inc. Irvine, Calif., (714) 455-1688	DE-205 TP	PC ATs and above; ISA bus; half-slot	16-bit	8K-byte RAM packet buffer; doubles as 4-port hub	Most popular NOSs, including NetWare, D-Link's LANsmart, 3+ Share; Novell- and NETBIOS-compatible	None	4 LEDs	RJ-45, AUI	None specified	\$495/1 year parts and labor	Tech Data, GBC Distributors, Technology Marketing Group, PC Distributing, Nimax Micro Distributors and MP Systems
	DE-200TP	PC ATs and above; ISA bus; half-slot	16-bit	8K-byte RAM packet buffer	NE2000-compatible; drivers supplied for all popular NOSs	None	4 LEDs	RJ-45, AUI	None specified	\$375/1 year parts and labor	Tech Data, GBC Distributors, Technology Marketing Group, PC Distributing, Nimax Micro Distributors and MP Systems
	DE-100TP	Any PC; ISA bus; half-slot	8-bit	8K-byte RAM packet buffer	NE1000-compatible; drivers supplied for all popular NOSs	None	4 LEDs	RJ-45, AUI	None specified	\$320/1 year parts and labor	Tech Data, GBC Distributors, Technology Marketing Group, PC Distributing, Nimax Micro Distributors and MP Systems
	DE-300TP	PS/2s with MCA; half-slot	16-bit	8K-byte RAM packet buffer	Drivers supplied for all popular NOSs	None	4 LEDs	RJ-45, AUI	None specified	\$495/1 year parts and labor	Tech Data, GBC Distributors, Technology Marketing Group, PC Distributing, Nimax Micro Distributors and MP Systems
	DE-600TP	Any PC via parallel port	8-bit	8K-byte RAM packet buffer	Drivers supplied for all popular NOSs	None	4 LEDs	RJ-45	No configuration jumpers or switches	\$320/1 year parts and labor	Tech Data, GBC Distributors, Technology Marketing Group, PC Distributing, Nimax Micro Distributors and MP Systems
David Systems, Inc. Sunnyvale, Calif. (408) 720-8000	Ether-T PC/AT Adapter	PC AT and above	16-bit	64K-byte packet buffer, selectable I/O and interrupts	NetWare, LAN Manager, Banyan Systems, Inc.'s VINES	None	LEDs for link status, collisions and activity	RJ-45, AUI	Jumper selection for pre-10Base-T hubs	\$375/2 years	Unspecified VARs, system integrators, regional and national distributors
Dayna Communications, Inc. Salt Lake City (801) 531-0600	DaynaPORT E/SE-T	Macintosh SE; PDS; full-slot	16-bit	32K-byte RAM packet buffer	Supports AFP, TCP/IP, DECnet, OSI, A/UX, NetWare NCP and IPX protocols	None	Not specified	RJ-45	Supports SynOptics' Lattisnet concentrators (pre-10Base-T)	\$299/Lifetime	International and domestic distributors, VARs and dealers
	DaynaPORT E/II-T	Macintosh II; NuBus; full-slot	16-bit	16K-byte RAM packet buffer	Supports AFP, TCP/IP, DECnet, OSI, A/UX, NetWare NCP and IPX protocols	None	Not specified	RJ-45	Supports Lattisnet concentrators (pre-10Base-T)	\$299/Lifetime	International and domestic distributors, VARs and dealers
	DaynaPORT E/30-T	Macintosh SE/30 or Macintosh II/si with 030 Direct Slot Card	32-bit	16K-byte RAM packet buffer	Supports AFP, TCP/IP, DECnet, OSI, A/UX, NetWare NCP and IPX protocols	None	Not specified	RJ-45	Supports Lattisnet concentrators (pre-10Base-T)	\$299/Lifetime	International and domestic distributors, VARs and dealers

AFP = AppleTalk File Protocol  
 AUI = Attachment unit interface  
 DMA = Direct memory access  
 EEPROM = Electrically erasable programmable read-only memory  
 EISA = Extended Industry Standard Architecture  
 FPC = Floating-point coprocessor  
 FPU = Floating-point unit

IPX = Internetwork Packet Exchange  
 ISA = Industry Standard Architecture  
 MCA = Micro Channel Architecture  
 NCP = Novell's NetWare Core Protocol  
 NDIS = Microsoft's Network Driver Interface Specification  
 NIC = Network interface card  
 NOS = Network operating system

ODI = Open Data-Link Interface  
 PC-NFS = Sun's Personal Computer-Network File System  
 PDS = Processor direct slot  
 PROM = Programmable read-only memory  
 SCSI = Small Computer System Interface  
 SNMP = Simple Network Management Protocol  
 VAR = Value-added reseller

This chart includes a representative selection of 10Base-T adapter cards. These vendors may offer other adapter cards, and other vendors not included may offer a full range of products.

SOURCE: NEWPORT CONSULTING, SCITUATE, MASS.



# This is no way to conduct LAN management.



## Introducing the Maestro Intelligent Switching Hub. The only way to orchestrate your LANs right from your desktop.

It seems the more critical your Token Ring LANs become, the more time you waste in the wiring closet—reconfiguring rings, connecting spares, adding users. It's error-prone, time-consuming and unproductive.

Now Bytex® introduces a way to really *manage* your network: the Maestro™ Intelligent Switching Hub™

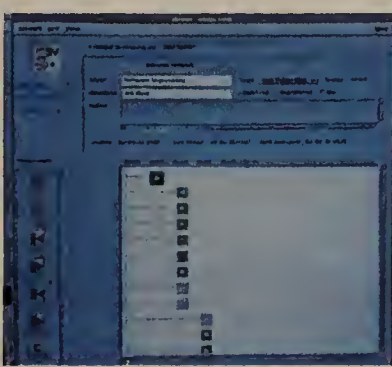
**maestro**

**Token Ring control at the flick of a wrist.** Maestro uses Bytex's proven switching technology to provide LAN configuration and management under soft-

ware control. Right from your desktop. Need to move a PC from one ring to another? Just change it on your screen and Maestro reconfigures it. Need to replace a

failed unit with a spare? Maestro switches it on-line for you. No more trips to the wiring closet. No more delays while you struggle with cabling. It's a new era in LAN control and management.

**How does 99.99% availability sound?** For over 10 years, mis-



sion-critical networks worldwide have relied on Bytex's redundant, fault-tolerant switching technology to achieve 99.99% uptime. Now Maestro brings that same technology to Token Ring LANs. Maestro means higher network availability, improved productivity and reduced cost.

### **Ask for a private audition.**

If you're using LANs for critical applications, you need the control and reliability that only Maestro offers. Call Bytex today.

Once you see what Maestro can do, you'll sing its praises, too.  
**Call 1-800-23-BYTEX.**

- Code: NW100791
- ☐ Rush me "The 6 Toughest Questions You Can Ask A Hub Vendor"—FREE!
- ☐ Contact me for a demonstration

Name \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

Telephone \_\_\_\_\_

Mail to: Bytex Corporation, 120 Turnpike Rd., Southborough, MA 01772-1886

Bytex is a registered trademark and Maestro and Intelligent Switching Hubs are trademarks of Bytex Corp.

# Bytex

**See Maestro Perform at InterOp - Booth #410; Networld - #2370**

Circle Reader Service #103



## 10Base-T adapter cards (continued on page 58)

Company	Product	System and bus	8-, 16- or 32-bit	Architecture	Drivers	Management	Diagnostics	Connections	Other features	Price/warranty	Distribution
Dayna Communications (continued)	DaynaPORT E/LC-T	Macintosh LC; PDS; full-slot	16-bit	DMA	Supports AFP, TCP/IP, DECnet, OSI, A/UX, NetWare NCP and IPX protocols	None	Not specified	RJ-45	Supports Lattisnet concentrators (pre-10Base-T)	\$299/Lifetime	International and domestic distributors, VARs and dealers
	DaynaPORT E/LC-TFP	Macintosh LC; PDS; full-slot	16-bit	DMA with on-board 68882 FPC	Supports AFP, TCP/IP, DECnet, OSI, A/UX, NetWare NCP and IPX protocols	None	Not specified	RJ-45	Supports Lattisnet concentrators (pre-10Base-T)	\$449/Lifetime	International and domestic distributors, VARs and dealers
	DaynaPORT E/si-T	Macintosh II/si; PDS; full-slot	32-bit	DMA	Supports AFP, TCP/IP, DECnet, OSI, A/UX, NetWare NCP and IPX protocols	None	Not specified	RJ-45	Supports Lattisnet concentrators (pre-10Base-T)	\$299/Lifetime	International and domestic distributors, VARs and dealers
	DaynaPORT E/si-TFP	Macintosh II/si; PDS; full-slot	32-bit	DMA with on-board 68883 FPC	Supports AFP, TCP/IP, DECnet, OSI, A/UX, NetWare NCP and IPX protocols	None	Not specified	RJ-45	Supports Lattisnet concentrators (pre-10Base-T)	\$299/Lifetime	International and domestic distributors, VARs and dealers
Digital Equipment Corp. Maynard, Mass. (800) 343-4040	EtherWORKS Turbo/TP	PC AT and above; ISA bus; half-slot	16-bit	DMA or shared memory with 64K-byte RAM packet buffer; optional remote boot	Shipped with drivers for DECnet/DOS, NDIS-compliant NOSs; NetWare client driver	Via various DECnet network management products	LEDs for power and link integrity; self-test ROM and diagnostic software	RJ-45, AUI	Meets European Class B emission standards	\$395/1 year	Direct or indirect channels; DECdirect catalog
Farallon Computing, Inc. Emeryville, Calif. (510) 596-9000	PhoneNET Card for NuBus	Macintosh II family, including Macintosh IIsi with adapter	16-bit	Not specified	Supplied by Farallon	None	LEDs for link integrity, traffic and errors	RJ-45, AUI	Automatic transceiver selection	\$395/1 year	Distributors, VARs, retail outlets and mail order
	PhoneNET Card for Macintosh SE/30	Macintosh SE/30; PDS	16-bit	Not specified	Supplied by Farallon	None	LEDs for link integrity, traffic and errors	RJ-45, AUI	Automatic transceiver selection	\$395/1 year	Distributors, VARs, retail outlets and mail order
	PhoneNET Card for Macintosh IIsi	Macintosh IIsi	16-bit	Not specified	Supplied by Farallon	None	LEDs for link integrity, traffic and errors	RJ-45, AUI	Automatic transceiver selection	\$395/1 year	Distributors, VARs, retail outlets and mail order
Frontier Technologies Corp. West Mequon, Wis. (414) 241-4555	802.3/TP-16 (AT)	PC ATs and above; ISA bus; full-slot	16-bit	512K-byte RAM with on-board Intel Corp. 80186; 16K-byte boot PROM	TCP/IP and OSI drivers supplied	None	Not specified	RJ-45	Designed for applications where off-loading host CPU is desired	\$895/90 days	Direct, VARs and distributors
	802.3/TP-16 (MCA)	PS/2s with MCA; full-slot	16-bit	512K-byte RAM with on-board Intel 80186; 16K-byte boot PROM	TCP/IP and OSI drivers supplied	None	Not specified	RJ-45	Designed for applications where off-loading host CPU is desired	\$895/90 days	Direct, VARs and distributors
	802.3/TP-8 10-Base-T	Any PC; ISA bus; half-slot	8-bit	512K-byte RAM with on-board Intel 80188; 8K-byte boot PROM	TCP/IP and OSI drivers supplied	None	Not specified	RJ-45	Designed for applications where off-loading host CPU is desired	\$695/90 days	Direct, VARs and distributors
	EtherAccess 1000	Any PC; ISA bus; half-slot	8-bit	8K-byte RAM packet buffer	TCP/IP and OSI drivers supplied	None	4 LEDs	RJ-45, AUI	None specified	\$395/90 days	Direct, VARs and distributors
Gandalf Data, Inc. Wheeling, Ill. (800) 426-3253	LANLine/AT	Any PC; ISA bus; full-slot	8- or 16-bit	16K-byte RAM packet buffer; 8K-byte boot EEPROM optional	NetWare 2.0 and above-, NDIS-, Personal Computer Standard Architecture- and TCP/IP-compatible	None	Not specified	RJ-45	None specified	\$299/1 year	Direct sales
Gateway Communications, Inc. Irvine, Calif. (714) 533-1555	G/EtherTwist PC	Any PC; ISA bus; half-slot	8-bit	40K-byte RAM packet buffer	Gateway provides a variety of drivers for all popular NOSs	None	Not specified	RJ-45	Works with pre-10Base-T hubs that don't use link test	\$300/1 year, repair or replacement	Unspecified distributors
	G/EtherTwist AT	PC ATs and above; ISA bus; 3/5-slot	16-bit	64K-byte RAM packet buffer	Gateway provides a variety of drivers for all popular NOSs	None	Not specified	RJ-45	Works with pre-10Base-T hubs that don't use link test	\$348/1 year, repair or replacement	Unspecified distributors
	G/EtherTwist MC	PS/2s or compatibles with MCA	16-bit	64K-byte RAM packet buffer	Gateway provides a variety of drivers for all popular NOSs	None	Not specified	RJ-45	Works with pre-10Base-T hubs that don't use link test	\$460/1 year, repair or replacement	Unspecified distributors
	G/EtherTwist AT Hub Expander	PC ATs and above; ISA bus; half-slot	8-bit	Provides 4 10Base-T ports	Gateway provides a variety of drivers for all popular NOSs	None	Not specified	RJ-45	2 can be attached to company's Hub Adapter for a total of 13 ports; can be cascaded for larger work groups	\$300/1 year, repair or replacement	Unspecified distributors
	G/EtherTwist AT Hub Adapter	PC AT or above; ISA bus; full-slot	16-bit	Provides adapter and hub functions (4 ports)	Gateway provides a variety of drivers for all popular NOSs	None	Not specified	RJ-45	Supports connection of 2 Hub Expanders	\$495/1 year, repair or replacement	Unspecified distributors
Hayes Microcomputer Products, Inc. Atlanta (404) 840-9200	Ethermate P/UTP	PS/2s or compatibles with MCA; full-slot	16-bit	Shared memory; 16K-byte RAM packet buffer; optional boot ROM socket	Drivers supplied for NetWare, LAN Manager, 3+ Open and NETBIOS LANs	None	Software supplied	RJ-45, AUI	Not specified	\$399/4-year limited	Wholesalers and resellers

AFP = AppleTalk File Protocol  
 AUI = Attachment unit interface  
 DMA = Direct memory access  
 EEPROM = Electrically erasable programmable read-only memory  
 EISA = Extended Industry Standard Architecture  
 FPC = Floating-point coprocessor  
 FPU = Floating-point unit

IPX = Internetwork Packet Exchange  
 ISA = Industry Standard Architecture  
 MCA = Micro Channel Architecture  
 NCP = Novell's NetWare Core Protocol  
 NDIS = Microsoft's Network Driver Interface Specification  
 NIC = Network interface card  
 NOS = Network operating system

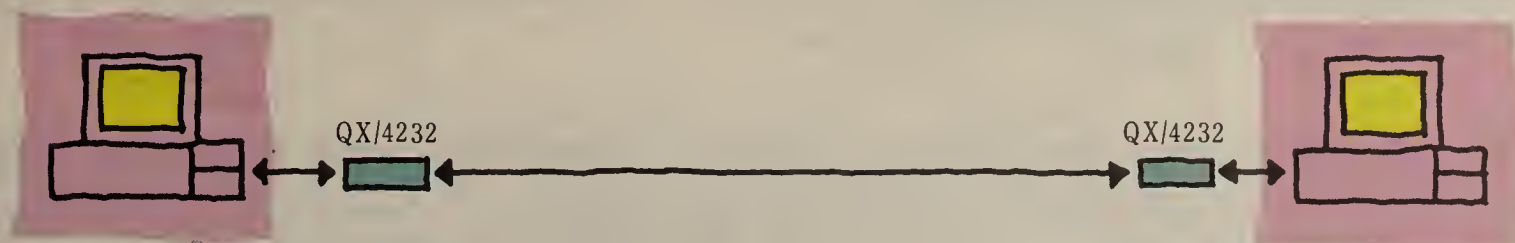
ODI = Open Data-Link Interface  
 PC-NFS = Sun's Personal Computer-Network File System  
 PDS = Processor direct slot  
 PROM = Programmable read-only memory  
 SCSI = Small Computer System Interface  
 SNMP = Simple Network Management Protocol  
 VAR = Value-added reseller

This chart includes a representative selection of 10Base-T adapter cards. These vendors may offer other adapter cards, and other vendors not included may offer a full range of products.

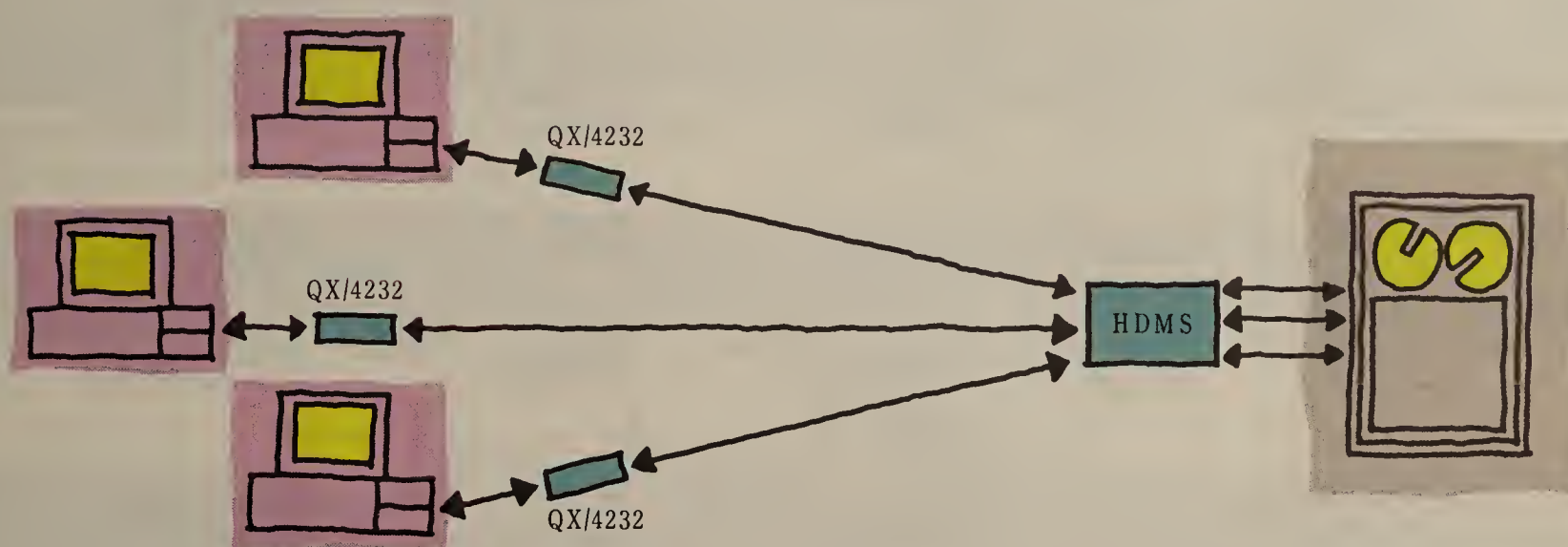
SOURCE: NEWPORT CONSULTING, SCITUATE, MASS.



# Our standalone V.32bis modems stand out in their class.



# Our modem management system is in a class by itself.



Whether you're looking for a high performance V.32bis modem to provide one-to-one dial-up access to computing resources, or a multiple terminal to mainframe modem management system, Microcom® has what you need.

For unsurpassed V.32bis throughput, take our QX/4232bis™ modem. It transmits at up to 38,400 bps. And it's fully compliant with all existing standards worldwide including CCITT V.32bis, V.42 and V.42bis.

The QX/4232bis features MNP® 10, the most advanced version of the industry standard Microcom Networking Protocol™. MNP 10 provides error free data transfer with Adverse Channel Enhancements™ (ACE™) to automatically adjust transfer rates up or down depending upon line conditions.

Our HDMS™ is a chassis-based, data center solution that provides unprecedented dial-up

network management capabilities as well as proven dial access security.

And it's all from Microcom. The head of its class in price/performance.



Call **1-800-822-8224**

today for complete information. We'll send you your choice of Microcom's FREE technology guides on "Microcom Networking Protocol" or "Managing a Dial Up Network." Or complete and mail this coupon to Microcom.

Please send me: ☐ "Microcom Networking Protocol" guide  
☐ "Managing a Dial Up Network" guide

Name \_\_\_\_\_ Title \_\_\_\_\_  
 Company \_\_\_\_\_  
 Street \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
 Telephone \_\_\_\_\_



NW10/7

Microcom, Inc., Technology Guides  
 500 River Ridge Drive, Norwood, Massachusetts 02062-5028  
 (617) 551-1000, Fax: (617) 551-1021, International Fax: (617) 551-1007

Microcom and MNP are registered trademarks and Microcom Networking Protocol, QX/4232bis, Adverse Channel Enhancements, ACE, and HDMS are trademarks of Microcom Systems, Inc., © Microcom, Inc., 1991. All rights reserved.



## 10Base-T adapter cards (continued on page 62)

Company	Product	System and bus	8-, 16- or 32-bit	Architecture	Drivers	Management	Diagnostics	Connections	Other features	Price/warranty	Distribution
Hayes (continued)	Ethermate Trio16	PC ATs and above; ISA bus; ¾-slot	16-bit	Shared memory; 16K-byte RAM packet buffer; optional boot ROM socket	Drivers supplied for NetWare, LAN Manager, 3+Open and NETBIOS LANs	None	Software supplied	RJ-45, AUI	Automatic polarity detection and correction; supports zero wait states for high-performance servers	\$349/4 year, limited	Wholesalers and resellers
	Ethermate 8 UTP	Any PC; ISA bus; ¾-slot	8-bit	Shared memory; 16K-byte RAM packet buffer; optional boot ROM socket	Drivers supplied for NetWare, LAN Manager, 3+Open and NETBIOS LANs	None	Software supplied	RJ-45, AUI	Automatic polarity detection and correction	\$329/4 year, limited	Wholesalers and resellers
Hewlett-Packard Co. Cupertino, Calif. (800) 752-0900	HP EISA Adapter Card/32	PCs with EISA bus	32-bit	64K-byte RAM packet buffer; burst DMA data transfer	Drivers supplied for all popular NOSs	None	LEDs for transmit and receive	RJ-45, AUI	Support for some pre-10Base-T hubs	\$695/1 year	Direct, dealers, distributors and VARs
	HP EtherTwist Adapter Card/16	PC ATs and above	16-bit	64K-byte RAM packet buffer	Drivers supplied for all popular NOSs	None	LEDs for transmit and receive	RJ-45, AUI	RJ-11 jack for breakout of phone wires; support for some pre-10Base-T hubs	\$445/1 year	Direct, dealers, distributors and VARs
	HP EtherTwist Adapter Card/8	Any PC; ISA bus	8-bit	32K-byte RAM packet buffer	Drivers supplied for all popular NOSs	None	LEDs for transmit and receive	RJ-45, AUI	RJ-11 jack for breakout of phone wires; support for some pre-10Base-T hubs	\$345/1 year	Direct, dealers, distributors and VARs
	HP MCA Adapter Card/16	PS/2s and compatibles with MCA	16-bit	32K-byte RAM packet buffer	Drivers supplied for all popular NOSs	None	LEDs for transmit and receive	RJ-45, AUI	RJ-11 jack for breakout of phone wires; support for some pre-10Base-T hubs	\$399/1 year	Direct, dealers, distributors and VARs
Hong Technologies, Inc. Mountain View, Calif. (415) 964-0100	HT-NE1000TP	Any PC; ISA bus; half-slot	8-bit	Has socket for 8K-byte boot PROM	Not supplied; compatible with NE1000	None	LED for link integrity	RJ-45, AUI	Supports multiple NICs for internal bridging	\$295/5 years	Distributors (Costa Distributing, Comptech International)
	HT-NE2000TP	PC ATs and above; ISA bus; ¾-slot	16-bit	Has socket for 8K-byte boot PROM	Not supplied; compatible with NE2000	None	LED for link integrity	RJ-45, AUI	Supports multiple NICs for internal bridging	\$345/5 years	Distributors (Costa Distributing, Comptech International)
	HT-AT116ETP	PC ATs and above; ISA bus; ¾-slot	16-bit	Has socket for 8K-byte boot PROM; 64K-byte RAM packet buffer	Written and supplied by Hong for NetWare, LAN Manager and FTP Software, Inc.'s PC/TCP	None	LEDs for link integrity, activity and collisions	RJ-45, AUI	Supports multiple NICs for internal bridging; pregenerated IPX shell	\$375/5 years	Distributors (Costa Distributing, Comptech International)
	HT-PP108ETP	Any PC with parallel port	8-bit	Not specified	Written and supplied by Hong for NetWare	None	LEDs for link integrity, activity and collisions	RJ-45	Pass-through parallel port for concurrent local printer use; pregenerated IPX shell driver	\$395/2 years	Distributors (Costa Distributing, Comptech International)
IMC Networks Corp. Tustin, Calif. (714) 259-1020	PCnic TP (64K version)	PC ATs and above; ISA bus; ¾-slot	16-bit	64K-byte RAM packet buffer	Supplied but not specified	None	Not specified	RJ-45, AUI	Works with pre-10Base-T hubs via jumper selectable link integrity	\$350/5 years	Distributors
	PCnic TP (16K version)	PC ATs and above; ISA bus; ¾-slot	16-bit	16K-byte RAM packet buffer	Supplied but not specified	None	Not specified	RJ-45, AUI	Works with pre-10Base-T hubs via jumper selectable link integrity	\$325/5 years	Distributors
	PCnic II (TP 16K version)	PS/2s and compatibles with MCA	16-bit	16K-byte RAM packet buffer	Supplied but not specified	None	Not specified	RJ-45, AUI	Works with pre-10Base-T hubs via jumper selectable link integrity	\$350/5 years	Distributors
	PCnic II (TP 64K version)	PS/2s and compatibles with MCA	16-bit	64K-byte RAM packet buffer	Supplied but not specified	None	Not specified	RJ-45, AUI	Works with pre-10Base-T hubs via jumper selectable link integrity	\$375/5 years	Distributors
	PCnic 8bit TP	Any PC; ISA bus; half-slot	8-bit	8K-byte packet buffer	Supplied but not specified	None	Not specified	RJ-45, AUI	Works with pre-10Base-T hubs via jumper selectable link integrity	\$275/5 years	Distributors
Intellicom, Inc. Chatsworth, Calif. (818) 407-3900	TPair-8T	Any PC; ISA bus; half-slot	8-bit	Not specified	Not supplied; NE1000-compatible	SNMP in first quarter of 1992	Not specified	RJ-45	Compatible with most pre-10Base-T hubs	\$179/2 years	Ingram Micro, Merisel and Tech Data
	TPair-16T	PC ATs and above; ISA bus; ¾-slot	16-bit	Not specified	Not supplied; NE1000-compatible	SNMP in first quarter of 1992	Not specified	RJ-45	Compatible with most pre-10Base-T hubs	\$199/2 years	Ingram Micro, Merisel and Tech Data
	TPair-PNA	Any PC with parallel ports	8-bit	Not specified	Not supplied; NE1000-compatible	SNMP in first quarter of 1992	Not specified	Parallel port	Compatible with most pre-10Base-T hubs; built-in auxiliary parallel port	\$399/5 years	Ingram Micro, Merisel and Tech Data
Kodiak Technology San Jose, Calif. (408) 441-6900	Raven-8 UTP	Any PC; ISA bus; half-slot	8-bit	64K-byte RAM packet buffer; optional boot PROM	Novell certified drivers	CHKNET diagnostic software; LED for link detection	CHKNET diagnostic software; LED for link detection	RJ-45	Handles reversed polarity	\$249/5 years, unconditional	Tech Data and Arrow Electronics, Inc.

AFP = AppleTalk File Protocol  
 AUI = Attachment unit interface  
 DMA = Direct memory access  
 EEPROM = Electrically erasable programmable read-only memory  
 EISA = Extended Industry Standard Architecture  
 FPC = Floating-point coprocessor  
 FPU = Floating-point unit

IPX = Internetwork Packet Exchange  
 ISA = Industry Standard Architecture  
 MCA = Micro Channel Architecture  
 NCP = Novell's NetWare Core Protocol  
 NDIS = Microsoft's Network Driver Interface Specification  
 NIC = Network interface card  
 NOS = Network operating system

ODI = Open Data-Link Interface  
 PC-NFS = Sun's Personal Computer-Network File System  
 PDS = Processor direct slot  
 PROM = Programmable read-only memory  
 SCSI = Small Computer System Interface  
 SNMP = Simple Network Management Protocol  
 VAR = Value-added reseller

This chart includes a representative selection of 10Base-T adapter cards. These vendors may offer other adapter cards, and other vendors not included may offer a full range of products.

SOURCE: NEWPORT CONSULTING, SCITUATE, MASS.





INTERNATIONAL  
COMMUNICATIONS  
ASSOCIATION

and



*present the sixth annual*

# Call For Innovation

## Network professionals with user companies:

**Get the recognition you deserve for your innovative applications of network technology  
Enter the International Communications Association/*Network World* Call for Innovation!**

**T**hrough the Call for Innovation, the International Communications Association and *Network World* honor network professionals within the user community for the creative application of network technology to solve problems and create new business opportunities.

The Call for Innovation is your forum for sharing with peers innovative network solutions you've developed. Network professionals who are recognized for their extraordinary work will have the opportunity to present their projects to the ICA membership and other network professionals at a featured session

during the ICA 1992 conference to be held May 17 - 22 in Atlanta.

The ICA will publish a journal of all qualified Call for Innovation papers. Presentations will also be considered for publication in ICA's award-winning *Communiqué*, a publication that reaches network executives in nine countries. In addition, Call for Innovation participants will be able to share their experiences with peers in a one-on-one setting on the exposition floor during special "Poster Sessions" at the ICA conference. **All entries must be received by December 31, 1991.**

## How does it work?

Submit a 150- to 250-word abstract describing your work in one of the following categories.

The abstract should focus on the unique aspects of your project.

**1.** An innovative application of network technology to solve a problem or gain a competitive advantage. The problem resolved or the competitive advantage gained should be clearly described.

**2.** Work you've undertaken with a vendor to develop a new product or service needed by your company. The product or service innovation should be clearly defined.

**3.** Actions taken by your company that had a material influence on the standards-setting or regulatory process. Clearly describe the impact of your efforts.

**4.** Original research conducted in your organization that resulted in new applications for technology. The application and research methodology should be clearly outlined.

1. Name \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

Tel. No.: \_\_\_\_\_

2. Abstract

Please write or type your abstract on a separate sheet, attach it to this form and mail the entry to Special Projects Editor, Network World, 161 Worcester Road, Framingham, Mass. 01701. You may also fax your submissions to *Network World* at (508) 820-3467. Please be sure to fill out your name, title, address and telephone number. If you qualify, you will be contacted by a representative of ICA or *Network World* for additional information. **All entries must be received by Dec. 31, 1991.**



(continued from page 51)

over and above the standard drivers (usually 5K bytes or less) of today. A LAN adapter driver performs the same function as a printer driver, enabling the card to communicate with a particular network operating system and workstation.

The bad news is that running SNMP in the background to track node status will slow performance. For this reason, most implementations will enable network managers to turn the SNMP management on and off.

Because of this additional overhead, HP is not going to implement a full SNMP agent for the adapter but will instead concentrate on building additional intelligence into its hubs to gain the same infor-

mation. Thus, while most adapter vendors plying the corporate market (as opposed to the velcro LAN market) will offer an SNMP agent option for its drivers, hub makers, if they follow HP's lead, may make this a moot requirement.

Although only a handful of vendors offer SNMP agents at the node level today, many will be introducing SNMP agents this week at INTEROP 91 Fall or within the next few fiscal quarters. These agents will support the Management Information Base (MIB) II specification and will enable an SNMP management station to collect not only performance and status information, but also detailed information about the workstation itself.

An indicator of the intense interest in

SNMP is that Epilogue Technologies, Inc. of Ventura, Calif., which licenses SNMP agents to 10Base-T and other vendors, says that it has more than 30 OEMs. These OEMs will include SNMP software with their drivers (a change that will not require that cards be redesigned).

According to Dave Preston, Epilogue's vice-president of marketing, many extensions end up being supported because the management station vendors, such as HP, Digital Equipment Corp., IBM and Sun Microsystems, Inc., all want to say they can support as wide an array of devices and vendors as possible.

Thus, vendors with extensions to the MIB II standard or to special interest group extensions to it publish their specifications

to make it as easy as possible for management station vendors to incorporate them. After all, if the management station software does not know an extension exists, it cannot use it.

What is it that users want to know about the status of their 10Base-T nodes? They want to know more than what the LEDs on most adapters can tell them (such as link status, activity and jabber), and they want to know it without having to trek to every office in the building.

A key area of interest is station information, including the processor, user, memory left, Basic I/O System version, DOS version, disk space left and software being used. Users also want to be able to flag certain events for unspecified action and to turn an adapter on and off remotely. All this will be possible with SNMP agents based on the basic MIB II specification.

### Choosing your weapon

Users must consider many issues when choosing an adapter. However, it all boils down to four key elements: price, performance, flexibility and manageability. Where price is concerned, 8-bit adapters are the cheapest.

Among the lower cost cards available, Addtron, Artisoft and Intellicom all offer 8-bit models listing for under \$200, with street prices not much over \$100. These companies' 16-bit adapters cost about \$20 to \$30 more.

Among high-performance adapters, EISA adapters range in price from \$499 (Advanced Digital Corp.) to \$695 (AT&T and HP). MCA adapters range in price from \$399 for HP's 16-bit model and \$495 for 3Com Corp.'s 32-bit model to up to around \$700. Within each category, there is a range of performance and features to consider.

An adapter's relative performance potential is determined by four basic factors: the word length supported (8-, 16- or 32-bit), the host access method (the way in which data is transferred from the LAN to the personal computer's memory), the amount of RAM for packet buffering and the driver software supplied for supporting various network operating systems and transport protocols.

If you have a personal computer based on an Intel Corp. 80286, 8088 or compatible chip on your desktop, an 8-bit card is the only ticket. Anything more would be a waste of money because the personal computer will not be able to take advantage of the potential extra throughput the 16-bit card offers.

In other cases, the choice gets more complicated. If you have an Intel 80386-based microcomputer with an ISA bus, the choice really depends on the kind of work you do. If you do a lot of data-intensive work that involves moving large files or heavy I/O and the load on the LAN is fairly light (under 35% of total capacity), then the small added cost of a 16-bit card will probably be worth it. Paradoxically, a 16-bit card will buy you far less in performance when the loads are heavy because throughput will be limited somewhat by bandwidth contention.

If you are looking for a server card on any size LAN, a 16-bit card with a 16K-byte RAM packet buffer (see the Architecture column in the accompanying charts) is the minimum you should choose to ensure good throughput. If there is a larger RAM packet buffer available, it's a good idea to opt for this, as the extra cost is usually min-

(continued on page 66)

# XYPLEX puts its reputation on-line at Interop

**Visit the SNMP, OSPF, Frame Relay and Xyplex booths for the latest in standards-based internetworking solutions from Xyplex.**

At Xyplex, we've built our reputation on 10 years of quality and innovation in the networking business. Counting many Fortune 500 companies among our clients, Xyplex is known for superior product design, unparalleled reliability and exceptional support.

Now we're applying our experience to internetworking and going on-line at Interop to demonstrate our solutions.

Workgroup routers, local and remote bridges and X.25 packet-switched gateways are an important part of our growing family of internetworking products. Visit the SNMP, OSPF, Frame Relay and Xyplex (#1820) booths, and ask for a demonstration.

**Call 1-800-338-5316 for more information.**

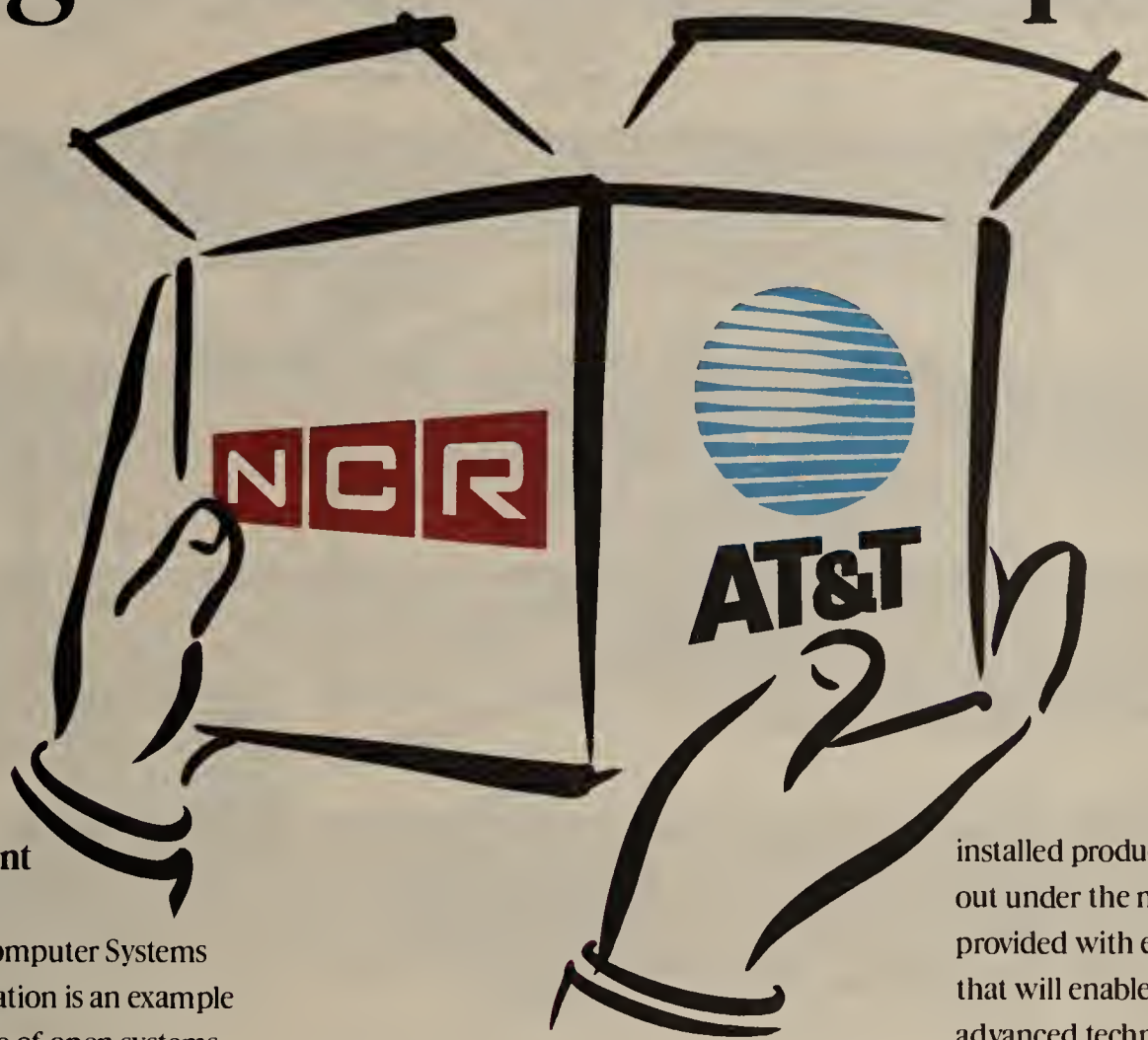
**XYPLEX**

**Xyplex at  
Interop  
Booth #1820**

Xyplex, Inc.  
330 Codman Hill Road  
Boxborough, MA 01719  
Fax 508.264.9930



# NCR And AT&T. Delivering The Promise Of Open Systems.



## A Shared Commitment To Open Systems.

The merger of AT&T Computer Systems Division with NCR Corporation is an example of the tremendous promise of open systems.

Other computer industry mergers have become snarled in efforts to resolve conflicts between incompatible hardware and operating systems. AT&T and NCR, unique among major computer companies, have for years been committed to delivering totally open systems. As a result, we've been able to merge our product lines in months rather than years.

*"This alliance should bring them into a market leadership position in the next 12 to 18 months. There's an unbelievable number of potential synergies between them, especially considering AT&T's expertise in telecommunications."*

—Chris Christiansen, The Meta Group

From personal computers to enterprise servers far surpassing mainframes in power, to an innovative suite of enterprise integration software, to the world's most comprehensive set of networking and connectivity products, no one is delivering more complete, and powerful, open systems solutions.

## A Merger Of Strengths.

NCR's Open, Cooperative Computing strategy has been acclaimed by analysts. And embraced by a fast-growing number of

customers. NCR brings exceptional strengths to the merger. Worldwide sales and marketing expertise, an excellent reputation in terminal and transaction processing, expert financial management, and demonstrated skill in designing and manufacturing innovative products.

AT&T's contributions to the new organization provide a remarkable synergy. Supplementing NCR's open, end-to-end computer family with the world's most sophisticated and complete suite of open networking products. The strength of a \$43 billion dollar international organization. And the R&D and cutting-edge technology resources of AT&T Bell Labs.

## Honoring Commitments To Customers.

NCR's new strengths will be instrumental in attracting a wide range of new customers. But we've also spent a great deal of time and effort ensuring that past and current AT&T and NCR customers are well served.

All customer commitments of both organizations will be fully honored, of course. Customers who have currently

installed product lines that will be phased out under the merged organization will be provided with effective migration strategies that will enable them to implement our advanced technology products without abandoning their current investment.

## A World Leader In Open, Enterprise-Wide Information Systems.

NCR is now the Networked Computing Resource of AT&T. With the people, the products, and the financial resources to become a key force in developing the transaction society of tomorrow.



*Open, Cooperative Computing is a completely open enterprise computing strategy backed by the resources of NCR and AT&T.*

Our goal is to create open, global computer networks that are as easy to use, as efficient, and as accessible as the telephone network is today.

NCR and AT&T. While others talk about the promise of open systems, we're delivering on it. For more information, phone 1-800-CALL NCR.



The Networked Computing Resource of AT&T

**Open, Cooperative Computing.  
The Strategy For Managing Change.**



## 10Base-T adapter cards (continued on page 64)

Company	Product	System and bus	8-, 16- or 32-bit	Architecture	Drivers	Management	Diagnostics	Connections	Other features	Price/warranty	Distribution
Kodiak Technology (continued)	Raven-16 UTP	PC ATs and above; ISA bus; half-slot	16-bit	64K-byte RAM packet buffer	Novell certified drivers	CHKNET diagnostic software; LED for link detection	CHKNET diagnostic software; LED for link detection	RJ-45	Handles reversed polarity	\$299/5 years, unconditional	Tech Data and Arrow Electronics
Lancast/Casat Technology, Inc. Amherst, N.H. (603) 880-1833	ENC-4103	Any PC	8-bit	8K-byte RAM packet buffer	NE2000-compatible	None	LEDs for activity, collisions and jabbering	RJ-45, AUI	Selectable interrupts and I/O addresses	\$275/3 years	Unspecified distributors, VARs and system integrators
	ENC-4104	PC ATs and above; ISA bus; half-slot	16-bit	8K-byte RAM packet buffer	NE2000-compatible	None	LEDs for activity, collisions and jabbering	RJ-45, AUI	Selectable interrupts and I/O addresses	\$325/3 years	Unspecified distributors, VARs and system integrators
Longshine Computer, Inc. San Jose, Calif. (408) 942-1746	ShineNet LCS-8834-T	Any PC; ISA bus; half-slot	8-bit	8-, 16- or 32K-byte RAM packet buffer; shared memory	Western Digital WD8003E-compatible	None	1 LED	RJ-45, AUI	Optional boot PROM; selectable I/O and interrupt addresses	\$329/1 year, repair or replacement	Unspecified distributors, dealers, VARs and OEMs
Megahertz Corp. Salt Lake City (801) 272-6000	T2ENT	Toshiba laptop internal bus	8-bit	Not specified	Uses Western Digital drivers	None	Not specified	RJ-45	Clone of Western Digital 8003 EB card	\$449/5 years	Distributors, major retail chains and resellers
	T2ENT	Toshiba laptop expansion bus	8-bit	Not specified	Uses Western Digital drivers; supports most popular NOSs	None	Not specified	RJ-45	Clone of Western Digital 8003 EB card	\$649/5 years	Distributors, major retail chains and resellers
Multi-Tech Systems, Inc. Mounds View, Minn. (612) 785-3500	EN301TP16	Any PC; ISA bus; full-slot	8- or 16-bit	Programmable I/O; optional boot PROM	Supplies NetWare drivers	None	Not specified	RJ-45, AUI, BNC	Works with some pre-10Base-T hubs, including Multi-Tech's own and Starlan 10 hubs	\$349/2 years	Dealers, representatives and VARs
	EN301TP8	Any PC; ISA bus; half-slot	8-bit	Programmable I/O; optional boot PROM	Supplies NetWare drivers	None	Not specified	RJ-45, AUI, BNC	Works with some pre-10Base-T hubs, including Multi-Tech's own and Starlan 10 hubs	\$329/2 years	Dealers, representatives and VARs
	EN301TPPS	PS/2s and compatibles with MCA	16-bit	Programmable I/O; optional boot PROM	Supplies NetWare drivers	None	Not specified	RJ-45, AUI, BNC	Works with some pre-10Base-T hubs, including Multi-Tech's own and Starlan 10 hubs	\$489/2 years	Dealers, representatives and VARs
	EN301TP8R	Any PC; ISA bus; full-slot	8-bit	Programmable I/O; optional boot PROM	Supplies NetWare drivers	None	Not specified	RJ-45, AUI, BNC	Works with some pre-10Base-T hubs, including Multi-Tech's own and Starlan 10 hubs	\$349/2 years	Dealers, representatives and VARs
National Semiconductor Corp. Santa Clara, Calif. (408) 721-5020	EtherNODE 16 MC-T	PS/2s or compatibles with MCA; full-slot	16-bit	Not specified	NE2000 drivers supplied by Novell	None	Not specified	RJ-45	Company's optional Checkpoint package for security and virus detection	\$350/5 years	Dealers and VARs
	EtherNODE 16 AT-T	Any PC; ISA bus; ¾-slot	8- or 16-bit	Not specified; software configured	NE2000 drivers supplied by Novell	None	Not specified	RJ-45	Optional Checkpoint package for security and virus detection	\$250/5 years	Dealers and VARs
	EtherNODE SE/30-T	Macintosh SE/30; PDS	32-bit	DMA; uses system memory for packet buffer	NE2000 drivers supplied by Novell	None	Software supplied	RJ-45, AUI	Optional Checkpoint package for security and virus detection; autoconfiguring	\$449/5 years	Dealers and VARs
	EtherNODE SE-T	Macintosh SE; PDS	16-bit	Not specified	NE2000 drivers supplied by Novell	None	Software supplied	RJ-45, AUI	Optional Checkpoint package for security and virus detection; autoconfiguring	\$449/5 years	Dealers and VARs
	EtherNODE NB-T	Macintosh IIs with NuBus	16-bit	Not specified	NE2000 drivers supplied by Novell	None	Software supplied	RJ-45, AUI	Optional Checkpoint package for security and virus detection; autoconfiguring	\$399/5 years	Dealers and VARs
NDC Communications, Inc. San Jose, Calif. (408) 428-9108	OpenEther/N1	Any PC; ISA bus; half-slot	8-bit	8K-byte RAM packet buffer; optional boot PROM	Supplied for NE1000 compatible, 3+Share, TCP/IP, PC-NFS and NETBIOS	None	LEDs	RJ-45, AUI	Selectable interrupts, RAM buffer, I/O addresses	\$295/1½ to 2 years	VARs and local distributors
	OpenEther/N2	PC ATs; ISA bus; half-slot	16-bit	16K-byte RAM packet buffer; optional boot PROM	Supplied for NE2000-compatible, 3+Share, TCP/IP, PC-NFS and NETBIOS	None	LEDs	RJ-45, AUI	Selectable interrupts, RAM buffer and I/O addresses	\$295/1½ to 2 years	VARs and local distributors
	OpenEther/WD	Any PC; ISA bus; half-slot	8-bit	8K- or 32K-byte RAM packet buffer; optional boot PROM	Supplied for NetWare 2.1 and 3.x, 3+Share, TCP/IP, PC-NFS and NETBIOS	None	LEDs	RJ-45, AUI	Selectable interrupts, RAM buffer and I/O addresses	\$295/1½ to 2 years	VARs and local distributors
	OpenEther/NII	PS/2s with MCA	16-bit	16K-byte RAM packet buffer; optional boot PROM	Supplied for NetWare 2.1 and 3.x, 3+Share, TCP/IP, PC-NFS and NETBIOS	None	LEDs	RJ-45, AUI	Selectable interrupts, RAM buffer and I/O addresses	\$379/1½ to 2 years	VARs and local distributors

AFP = AppleTalk File Protocol  
 AUI = Attachment unit interface  
 DMA = Direct memory access  
 EEPROM = Electrically erasable programmable read-only memory  
 EISA = Extended Industry Standard Architecture  
 FPC = Floating-point coprocessor  
 FPU = Floating-point unit

IPX = Internetwork Packet Exchange  
 ISA = Industry Standard Architecture  
 MCA = Micro Channel Architecture  
 NCP = Novell's NetWare Core Protocol  
 NDIS = Microsoft's Network Driver Interface Specification  
 NIC = Network interface card  
 NOS = Network operating system

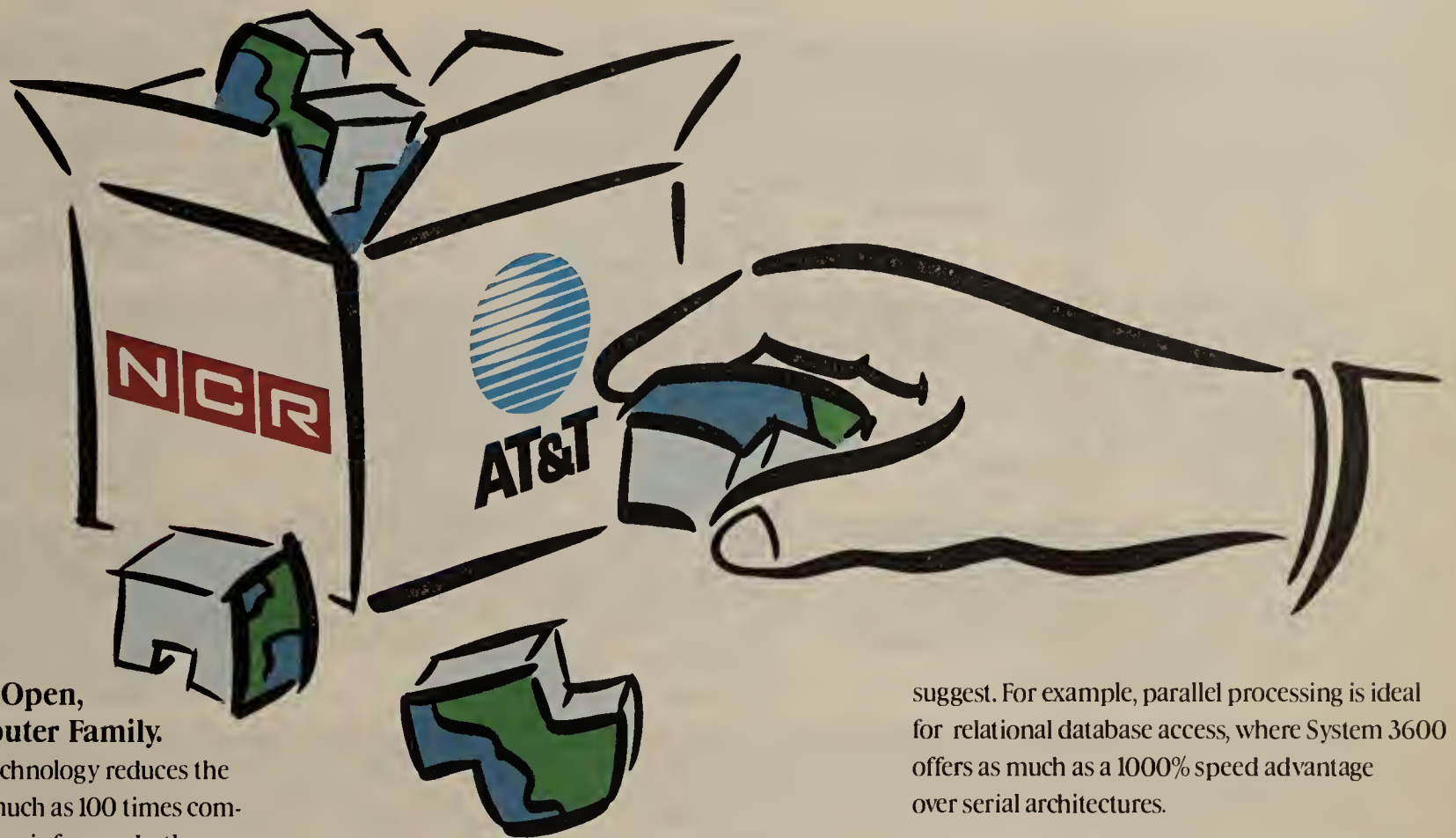
ODI = Open Data-Link Interface  
 PC-NFS = Sun's Personal Computer-Network File System  
 PDS = Processor direct slot  
 PROM = Programmable read-only memory  
 SCSI = Small Computer System Interface  
 SNMP = Simple Network Management Protocol  
 VAR = Value-added reseller

This chart includes a representative selection of 10Base-T adapter cards. These vendors may offer other adapter cards, and other vendors not included may offer a full range of products.

SOURCE: NEWPORT CONSULTING, SCITUATE, MASS



# Delivering The World's First Open, End-To-End Computer Family.



## The World's Only Open, End-To-End Computer Family.

Microprocessor technology reduces the cost of processing as much as 100 times compared to conventional mainframes. In the near future, that cost advantage is expected to grow to more than 300 times.

The NCR System 3000 brings this revolution in technology to a complete family of scalable platforms, running open operating systems like UNIX®, OS/2 and MS-DOS. To give you the widest range of open computing options in the industry.

From mobile, pen-based computers to desktops and large servers to future massively

designed specifically for mission-critical, enterprise applications. Our experience in tough commercial, retail, and financial service environments, coupled with our expertise in putting more power into fewer components have resulted in systems that meet the most demanding requirements.

All System 3000 workstation products are designed for the complexities of a multivendor, enterprise computing environment. And they are fully compatible with the larger members of the System 3000, providing you an unprecedented degree of scalability.

## Mainframe Power At A Fraction Of The Cost.

At the high end, NCR System 3600 is the first open system with the power needed to handle mission-critical applications. It surpasses the performance of conventional mainframes. At a fraction of the cost.

System 3600's unprecedented performance is made possible by an innovative parallel processing architecture that allows compute- and I/O-intensive tasks to be shared by dozens of microprocessors. This gives the System 3600 raw computing power conventional mainframes can't match. Over 2000 MIPS today. Double that in the near future.

In certain applications, the System 3600 performs even better than those numbers

suggest. For example, parallel processing is ideal for relational database access, where System 3600 offers as much as a 1000% speed advantage over serial architectures.

## World-Class Database Engines.

Effective enterprise systems must be able to handle databases containing hundreds of gigabytes of information. Current mainframes can typically only manage 50-100 gigabytes. The System 3600 can handle databases up to 300 GB now, and far larger ones in the near future.



System 3000 database servers are also fault-resilient, offering 99.9% or greater availability. Combining high reliability with NCR hot-pluggable disk array technology makes System 3000 servers true world-class engines for mission-critical applications.

NCR System 3000. The power others talk about for tomorrow. Deliverable today. For more information, phone 1-800-CALL NCR.

*"The 'Holy Grail' in the information industry is cheap, bountiful and easy-to-use computing in package sizes ranging from the personal desktop computer (or even the intimate handheld computer) to the enterprise-wide megaplex, preferably with the ability to upgrade through all points in between with minimum hassle. That ideal came closer to reality...when NCR announced its System 3000 family."*

*"No other 'traditional' vendor has yet announced an intention, much less demonstrated the capability, of doing anything close to NCR's System 3000 family."*

—George Lindamood, Gartner Group May 29, 1991

parallel systems, the NCR System 3000 is the only truly open, completely scalable, computer family in the world.

## The Personal Computers Designed Specifically For Enterprise Computing.

NCR's System 3000 workstations are



The Networked Computing Resource of AT&T

**Open, Cooperative Computing.  
The Strategy For Managing Change.**



## 10Base-T adapter cards (continued on page 69)

Company	Product	System and bus	8-, 16- or 32-bit	Architecture	Drivers	Management	Diagnostics	Connections	Other features	Price/warranty	Distribution
Network Interface Corp. Lexana, Kan. (913) 894-2277	10306	Any PC; ISA bus; ¾-slot	8- or 16-bit	Not specified	Optional, from either Network Interface or third party	None	Not specified	RJ-45, AUI, BNC	Connects to internal 4-port repeater card to form PC-based hub	\$295/2 years	Distributors
Network Resources Corp. Miltips, Calif. (408) 263-8100	Mac1000TP	Macintosh IIs with NuBus	16- or 32-bit	16K- or 64K-byte RAM packet buffer	Licensed from Apple; supports AppleTalk Phase 1 or 2 as well as third-party services	None	LEDs for link integrity, jabber, collisions, power and activity	RJ-45, AUI, BNC	Supports pre-10Base-T hubs from Cabletron, David Systems, ExpressNet, SynOptics, Ungermann-Bass, Inc.	\$295/3 years, with 30-day money back guarantee	Resellers, VARs and direct
	Mac1000SETP	Macintosh SE; PDS	16-bit	16K- or 64K-byte RAM packet buffer	Licensed from Apple; supports AppleTalk Phase 1 or 2 as well as third-party services	None	LEDs for link integrity, jabber, collisions, power and activity	RJ-45, AUI, BNC	Supports pre-10Base-T hubs from Cabletron, David Systems, ExpressNet, SynOptics and Ungermann-Bass	\$295/3 years, with 30-day money back guarantee	Resellers, VARs and direct
	Mac1000SITP	Macintosh SE/30 and SI; PDS	32-bit	16K- or 64K-byte RAM packet buffer; optional FPU with Macintosh IIs	Licensed from Apple; supports AppleTalk Phase 1 or 2 as well as third-party services	None	LEDs for link integrity, jabber, collisions, power and activity	RJ-45, AUI, BNC	Supports pre-10Base-T hubs from Cabletron, David Systems, ExpressNet, SynOptics and Ungermann-Bass	\$295/3 years, with 30-day money back guarantee	Resellers, VARs and direct
NetWorth, Inc. Irving, Texas (214) 869-1331	EtherNext 8-bit LAN Adapter	Any PC; ISA bus; half-slot	8-bit	Not specified	NE2000-compatible driver supplied; many others supported	Only via network hubs; SNMP support planned	LEDs	RJ-45 or AUI	Smart squelch noise reduction; extended distance support; pre-10Base-T hub support	\$349/1 year	Distributors, dealers and VARs
	EtherNext 16-bit LAN Adapter	PC ATs and above; ISA bus; half-slot	16-bit	Not specified	NE2000-compatible driver supplied; many others supported	Only via network hubs; SNMP support planned	6 diagnostic LEDs	RJ-45 or AUI	Smart squelch noise reduction; extended distance support; pre-10Base-T hub support	\$399/1 year	Distributors, dealers and VARs
	MicroChannel LAN Adapter	PS/2 or compatible with MCA; full-slot	16-bit	Not specified	NE2000-compatible driver supplied; many others supported	Only via network hubs; SNMP support planned	6 diagnostic LEDs	RJ-45 or AUI	Smart squelch noise reduction; extended distance support; pre-10Base-T hub support	\$449/1 year	Distributors, dealers and VARs
Nuvotech, Inc. Sausalito, Calif. (415) 331-7815	NuvoLink II-T	Macintosh IIs with NuBus	32-bit	16K-byte RAM packet buffer	Compatible with AppleShare, TOPS, NetWare	None	Software-based diagnostics	RJ-45, AUI	None specified	\$395/5 years	Direct sales
Plexcom, Inc. Simi Valley, Calif. (805) 522-3333	8082	Any PC; ISA bus; half-slot	8-bit	8K-byte RAM buffer	Compatible with Novell drivers	SNMP enables control by network manager	Not specified	RJ-45, AUI	None specified	\$349/1 year	Unspecified, VARs, resellers and distributors
	8083	PC AT and above; ISA bus; half-slot	16-bit	16K-byte RAM buffer	Compatible with Novell drivers	SNMP enables control by network manager	Not specified	RJ-45, AUI	None specified	\$349/1 year	Unspecified, VARs, resellers and distributors
Puredata, Ltd. Richmond Hill, Ontario (416) 731-6444	PDI8023-T1	Any PC; ISA bus; half-slot	8-bit	Shared memory with optional boot PROM	NetWare 2.x and 3.x, VINES (supplied by Banyan), NDIS, 3+ Open, TCP/IP	SNMP agent in development	LEDs for activity, polarity and link integrity	RJ-45	Drivers automatically configure adapter settings; no jumpers or switches; Western Digital-compatible	\$345/5 years	Distributors, resellers and OEMs
	PDI8023-16T	PC ATs and above; ISA bus; half-slot	16-bit	Shared memory with optional boot PROM	NetWare 2.x and 3.x, VINES (supplied by Banyan), NDIS, 3+ Open, TCP/IP	SNMP agent in development	LEDs for activity, polarity and link integrity	RJ-45, AUI, BNC	Drivers automatically configure adapter settings; no jumpers or switches; Western Digital-compatible	\$495/5 years	Distributors, resellers and OEMs
	PDI8023-16T1	PC ATs and above; ISA bus; half-slot	16-bit	Shared memory with optional boot PROM	NetWare 2.x and 3.x, VINES (supplied by Banyan), NDIS, 3+ Open, TCP/IP	SNMP agent in development	LEDs for activity, polarity and link integrity	RJ-45	Drivers automatically configure adapter settings; no jumpers or switches; Western Digital-compatible	\$445/5 years	Distributors, resellers and OEMs
	PDI8023-T	Any PC; ISA bus; half-slot	8-bit	Shared memory with optional boot PROM	NetWare 2.x and 3.x, VINES (supplied by Banyan), NDIS, 3+ Open, TCP/IP	SNMP agent in development	LEDs for activity, polarity and link integrity	RJ-45, AUI, BNC	Drivers automatically configure adapter settings; no jumpers or switches; Western Digital-compatible	\$395/5 years	Distributors, resellers and OEMs
	PDu C8023-T	PS/2s and compatibles with MCA	16-bit	Shared memory with optional boot PROM	NetWare 2.x and 3.x, VINES (supplied by Banyan), NDIS, 3+ Open, TCP/IP	SNMP agent in development	LEDs for activity, polarity and link integrity	RJ-45, AUI, BNC	Drivers automatically configure adapter settings; no jumpers or switches; Western Digital-compatible	\$445/5 years	Distributors, resellers and OEMs
Racal Interlan, Inc. Boxborough, Mass. (508) 263-9929	NIA310-10BT	Macintosh IIs with NuBus; full-slot	32-bit	Not specified	Supplied by Racal Interlan	Racal Interlan's Etherscope software for protocol analysis and packet monitoring	Not specified	RJ-45	Extended distance support	\$495/Lifetime	Distributors and OEMs
	NI5210/8-10BT	Any PC; ISA bus; half-slot	8-bit	Not specified	Supplied by Racal Interlan	Etherscope software for protocol analysis and packet monitoring	Not specified	RJ-45	Extended distance support	\$350/Lifetime	Distributors and OEMs
	NI5210/16-10BT	Any PC; ISA bus; half-slot	8-bit	Not specified	Supplied by Racal Interlan	Etherscope software for protocol analysis and packet monitoring	Not specified	RJ-45	Extended distance support; high-performance claimed	\$375/Lifetime	Distributors and OEMs

AFP = AppleTalk File Protocol  
 AUI = Attachment unit interface  
 DMA = Direct memory access  
 EEPROM = Electrically erasable programmable read-only memory  
 EISA = Extended Industry Standard Architecture  
 FPC = Floating-point coprocessor  
 FPU = Floating-point unit

IPX = Internetwork Packet Exchange  
 ISA = Industry Standard Architecture  
 MCA = Micro Channel Architecture  
 NCP = Novell's NetWare Core Protocol  
 NDIS = Microsoft's Network Driver Interface Specification  
 NIC = Network interface card  
 NOS = Network operating system

ODI = Open Data-Link Interface  
 PC-NFS = Sun's Personal Computer-Network File System  
 PDS = Processor direct slot  
 PROM = Programmable read-only memory  
 SCSI = Small Computer System Interface  
 SNMP = Simple Network Management Protocol  
 VAR = Value-added reseller

This chart includes a representative selection of 10Base-T adapter cards. These vendors may offer other adapter cards, and other vendors not included may offer a full range of products.

SOURCE: NEWPORT CONSULTING, SCITUATE, MASS.



# Delivering The Promise Of Open Systems Takes Cooperation.



## Integrating Open Systems Through COOPERATION.™

Conventional, proprietary systems have spawned islands of information that separate departments and impede workflow more effectively than any wall.

The answer is NCR COOPERATION. Software that integrates the general-purpose applications and platforms in your organization into one flexible, cooperative system with a consistent, intuitive graphic interface.

With the merger of NCR and AT&T Computer Systems Division, COOPERATION has been enhanced by the unique workflow automation capabilities offered by AT&T's Rhapsody.™

The result is an enterprise-oriented cooperative computing environment that has

technology, designed to integrate new and existing applications from many vendors, by providing a smooth exchange of data between the applications and by giving them a common look and feel.

## A More Humane Human Interface.

In COOPERATION's object-oriented human interface, icons are used to execute a series of tasks. For example, you simply select an icon of a report and the system will access databases throughout your enterprise, assemble the necessary information, and run the application you need to prepare the finished report.

By making the interface with the system both simpler and consistent across all applications, COOPERATION can help improve productivity, as well as reduce the time and cost of training.

## The Rewards Of COOPERATION.

COOPERATION is designed to offer rewards for everyone in your organization. Top management will find its ability to unite the entire organization can improve responsiveness, strengthening your competitive position. While facilitating more cost-effective implementation of information systems and a faster return on your IS investment.

COOPERATION can help MIS managers integrate multimachine, multivendor, multi-standard environments, providing the tools necessary to create and manage a complete enterprise-wide network. While lowering the cost of applications development.



And COOPERATION also aids software developers by simplifying the task of creating new applications.

COOPERATION can help your entire enterprise work together better than ever before. It can set your organization free from the rigid computer architectures of the past. Free from dependence on the vision of a single vendor. Free to meet the challenges of the future as you see fit.

To unleash the power of COOPERATION in your organization today, phone 1-800-CALL NCR.

*"NCR will have the most advanced product out there. They have demonstrated the power of object-oriented computing."*

—Steve Wendler, Gartner Group.

been recognized as superior to anything on the market.

## The Integrating Environment Revolution.

NCR COOPERATION is the first open, general-purpose integrating environment. It surrounds the operating system with applications, tools, and services that make more power more available than ever before.

COOPERATION uses leading-edge object



The Networked Computing Resource of AT&T

**Open, Cooperative Computing.  
The Strategy For Managing Change.**

NCR is the name and mark of NCR Corporation.  
COOPERATION is a trademark of NCR Corporation.  
Rhapsody is a trademark of AT&T.

© 1991 NCR Corporation.



(continued from page 60)

imal, and that buffer will ensure that packets do not have to be re-transmitted due to a full buffer.

A packet buffer is needed on shared memory architecture adapters because data is first transferred from the network to the adapter's memory and then on to the workstation's memory. On a card using direct memory

access (DMA), a buffer is not needed.

There are four basic host access methods: shared memory, DMA, programmed I/O and bus mastering. Of these, shared memory and DMA are used on about 90% of 10Base-T cards as they provide better throughput than programmed I/O.

Programmed I/O is offered

far less often, typically for use where there are memory conflicts between the LAN card, other cards in the personal computer or applications the personal computer runs. 3Com is one of the few that offers this as an option.

Bus mastering, typically associated with either EISA or MCA machines (although also available for ISA adapters), is offered

by a few vendors, and if done well, produces better performance than either shared memory or DMA, partly because it uses the CPU less.

Also, bus mastering enables multiple adapters to be used in concert to improve throughput by sharing the load in the same way that a disk array improves retrieval times.

Drivers are another critical factor because they play a major role in performance. If you are buying on the basis of price from a small vendor, finding a card that can use drivers from the network operating system vendor you use can be a smart move because the drivers supplied with the card may not perform as well.

Finding a card with a money back guarantee will also enable you to test the adapter's performance against others you already own without the permanent investment. Also remember that any SNMP agent provided with the card will come with drivers, which can vary considerably in the quality of implementation.

#### Card options

Flexibility is also an important consideration. Make sure the adapters you buy support a variety of interrupts and I/O ports because adapters that work today can run into conflicts when you add other cards or applications to your personal computer.

Look for a card that is self-configuring or supports software-based configuration so you don't have to go "under the hood" to make changes. Check for the availability of an optional boot programmable read-only memory as well, just in case the card ends up in a diskless personal computer.

Also, if you have pre-10Base-T unshielded twisted-pair hubs (primarily those from AT&T, David Systems, Inc., HP, Syn-Optics Communications, Inc. and 3Com), be sure the adapters you buy work with these hubs.

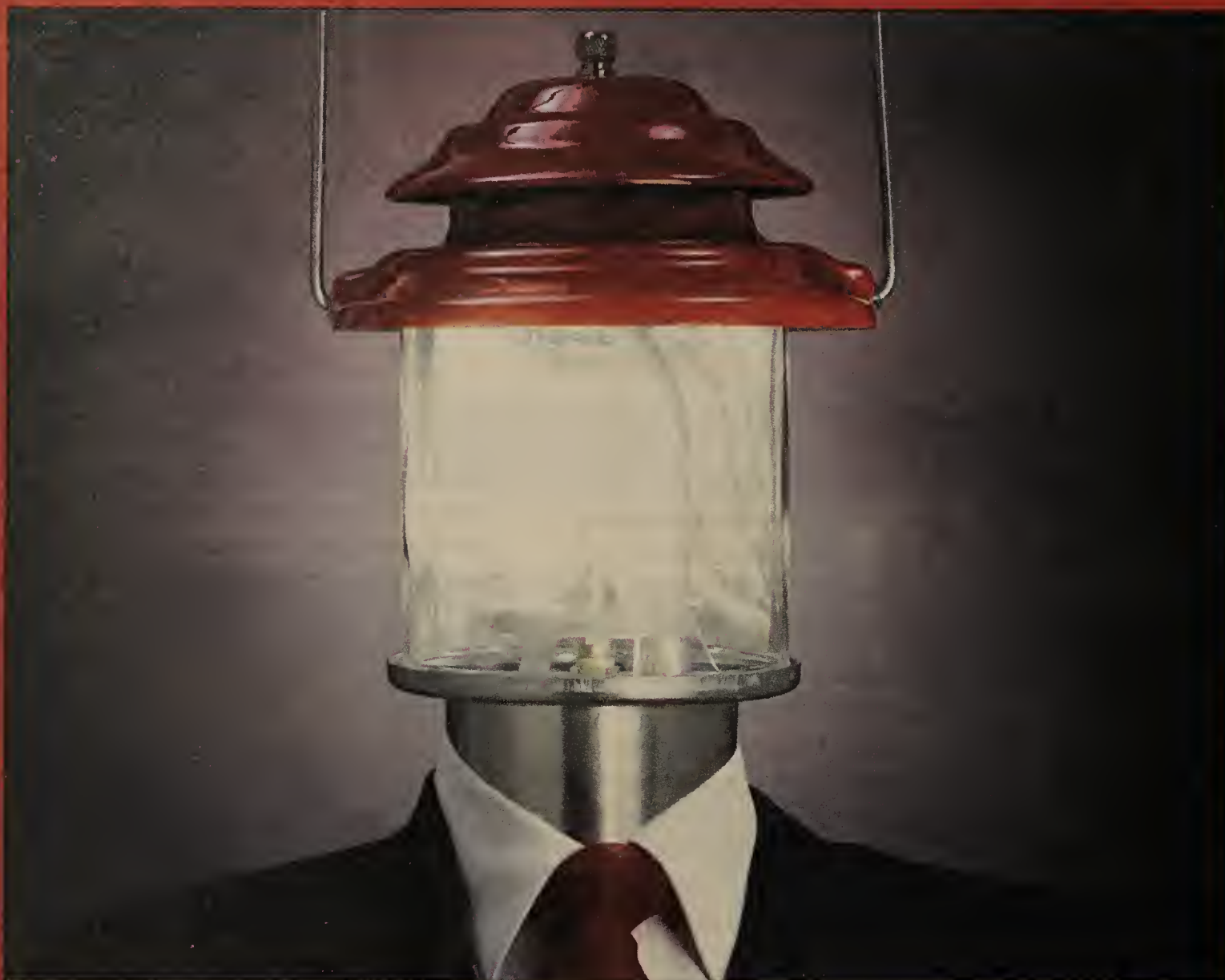
Finally, you may even want to consider adapters that support multiple host access methods, just in case some personal computers at your site present unusual installation problems due to your personal computer's configuration.

Diagnostics and management are also considerations, especially for large LANs where remote management will be key. As mentioned above, virtually all adapters have LEDs for diagnostics.

In addition, all the major hub vendors offer sophisticated, if not proprietary, network management schemes. Selecting a vendor that does not use SNMP, but rather a proprietary scheme, is not necessarily a problem if you do not have a near-term need to integrate this management scheme with that of another vendor's and you know the vendor is working on an SNMP version.

Over the next 12 months, SNMP will be adopted across the board, making a mix-and-match hub environment easier to handle. Some 10Base-T SNMP agent features that you should look for are the size of agent (the amount of extra memory above and beyond the driver it will require), the ability to enable and disable the agent at boot time or at any

(continued on page 96)



## Using a LANtern to get a complete view of your network can make you look a lot brighter.

Here's how to shed some light on your network. The LANtern™ network monitor. It provides a complete, non-intrusive view of all network activity. It can track all devices on any Ethernet network, noting common problems. So it helps you improve performance, prevent downtime, and plan for efficient growth.

Use it with Novell's LANtern Services Manager, a Windows-based console that provides a graphic view of your entire network. Or, since LANtern is the de facto industry standard SNMP monitor, you can choose a management console from over 15 third-party vendors, including SUN, DEC, NCR, and Hewlett-Packard.

So call 1-800-243-8526 today for a free demo disk. And let LANtern help you prove you have a good head on your shoulders.



The Past, Present, and Future of Network Computing.

Network Analysis Products Division. Multi-vendor network analysis & monitoring.

©1991 Novell, Inc. All rights reserved. Novell is a registered trademark and corporation. LANtern is a trademark of Novell, Inc. Windows is a trademark of Microsoft.



# Delivering The World's Most Complete Open Networking Environment.



## The World's Most Comprehensive Suite Of Connectivity Products.

Open Networking Environment (ONE) is the realization of our Open, Cooperative Computing strategy. It combines NCR's strength in industry-standard connectivity solutions with AT&T's broad range of advanced networking products.

As a result, we can offer networking solutions no other company can match. We're the UNIX® networking leader, and we have the people, the expertise, and the products, to implement your connectivity solutions, anywhere in the world.

ONE offers the first set of enterprise-wide networking products based on OSI. To give you transparent, enterprise-wide access across multiple networks, machines, and software. And ONE makes full use of the end-to-end scalability of the NCR System 3000 to bring new levels of power to your organization.

## Freedom Of Choice At The Desktop.

The heart of our networking story is the StarGROUP/3000™ System, with the introduction of StarGROUP® LAN Manager 2.0. These cooperative software modules offer a full suite of enterprise connectivity options with a wide range of workgroup interoperability configurations, providing a comprehensive client/server environment for distributed applications.

StarGROUP/3000 gives you a powerful,

flexible tool for making the transition from proprietary environments to ONE. You can grow from small LANs to large enterprise networks without architectural changes.

## Broad Connectivity With Tight Security.

Our StarLAN and StarWAN™ products let you connect multiple LANs into a comprehensive enterprise-wide network. In the office. Across the country. And around the world. No other vendor currently offers a more complete, cost-effective set of networking solutions.

High performance LANs have never been so affordable. Our networking products use the inexpensive unshielded twisted pair, coaxial, and fiber optic wiring which are probably already installed in your facilities to build secure and reliable 1, 10, and 100 Mbps LANs. NCR WaveLAN™ offers wireless networking. And our FDDI and SmartHUB products offer multiple protocol support with leading edge security, monitoring, and reliability.

## Enterprise Management For Your Enterprise Network.

Managing large networks and multiple networks is a critical task that will become even more critical in the future. StarSENTRY™

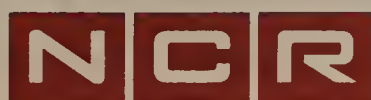
offers standard network management for today. And the ability to accommodate the anticipated standards of the future.

StarSENTRY lets you consolidate network management at a single platform located anywhere in the network. It gives you the tools to manage systems from multiple vendors. And the power to manage the large global networks of the future.



NCR's Open, Cooperative Computing strategy is a blueprint for managing change. A new way of computing—flexible enough to allow you to implement all or part of it, depending on your needs. A cost-effective, truly open, enterprise-wide solution with benefits that can help your organization compete more effectively in the years ahead.

To take delivery on the future of networking, phone 1-800-CALL NCR.



The Networked Computing Resource of AT&T

**Open, Cooperative Computing.  
The Strategy For Managing Change.**

NCR is the name and mark of NCR Corporation.  
WaveLAN is a trademark of NCR Corporation.  
StarWAN, StarSENTRY, StarGROUP/3000, and StarGROUP  
are trademarks or registered trademarks of NCR.

UNIX is a registered trademark of UNIX System Laboratories, Inc.  
© 1991 NCR Corporation.



# WE HARDLY EVER INTERNETWORK ON THE FIRST DATE.



Tired of the same old internetworking scene? Of aggressive salespeople saying things like, "Hey, have you seen our routers?" Or, "Have I got a node for you." When all you're looking for is someone who listens, who understands, who can deliver the right products to create your network computing environment. We'd like

to introduce ourselves. We're Wellfleet, and

we want to become your internetworking partner.

**FIRST**, we want to get to know you and your objectives. You'll talk to our Inquiry Services Group who'll review your needs, provide general information about Wellfleet products and help you understand the benefits of our technology in your enterprise computing scheme. Next, our Account Team gets to work. Two people, a sales representative and a network systems engineer, understand your needs in greater detail, then provide you with network consulting and design expertise. Along with a solution you can feel good about.

**THEN**, before you make a decision, we'll have you talk to other Wellfleet customers who've had similar problems. And we'll let you evaluate our products. Our family of multiprotocol router/bridges are designed from the inside out, with a symmetric multi-processor architecture, to satisfy the present and future demands of large organizations worldwide.

So you can match your network requirements with the appropriate Wellfleet system, our products provide system level performance from 15,000 packets per second to 480,000 packets per second. With plenty of functionality to internetwork multiple protocols like TCP/IP, DECnet, Novell IPX, XNS, AppleTalk, OSI, SNA,

Source Routing, Spanning Tree, OSPF, PPP and SNMP-based network management. Along with media such as Ethernet, Token Ring, FDDI, T1/E1. Also Frame Relay, SMDS, and X.25



services. To maximize internetwork availability, we ensure that our products are reliable and maintainable, too. By allowing for reconfiguration and hardware subsystem replacement.

On-line. And making sure CPU and I/O modules are easily accessible. **FINALLY**, no relationship is complete without ongoing support. From consulting and network design to educational services on internetworking concepts and operations. We offer telephone assistance 24 hours per day, seven days per week. And

worldwide on-site hardware support within four hours. Ask about our customized support programs, too. Send for our free booklet, entitled "Simplifying LAN-WAN Integration."

**CALL 1.617.275.2400, EXT 8.**

And you'll see the difference between a router vendor and a true internetworking partner.



©1991

Wellfleet Communications, Inc., 15 Crosby Drive,  
Bedford, MA 01730-1401 Fax: (617) 275-5001.

AUTHORIZED WELLFLEET DISTRIBUTORS IN AUSTRALIA, AUSTRIA, BELGIUM, CANADA, DENMARK, FRANCE, GERMANY, HOLLAND, HONG KONG, IRELAND, ISRAEL, ITALY, JAPAN, KOREA, LUXEMBOURG, MALAYSIA, MEXICO, NEW ZEALAND, NORWAY, SCOTLAND, SINGAPORE, SPAIN, SWEDEN, SWITZERLAND, TAIWAN, AND U.K.

Circle Reader Service #116

All trademarks are property of their respective companies.

NWFD1007



## 10Base-T adapter cards (continued on page 70)

Company	Product	System and bus	8-, 16- or 32-bit	Architecture	Drivers	Management	Diagnostics	Connections	Other features	Price/warranty	Distribution
Racal Interlan (continued)	NI6510-10BT	PC ATs and above; ISA bus; ¾-slot	16-bit	Not specified	Supplied by Racal Interlan	Etherscope software for protocol analysis and packet monitoring	Not specified	RJ-45	Extended distance support; high-performance claimed	\$395/Lifetime	Distributors and OEMs
	NI9210/16-10BT	PS/2s and compatibles with MCA; full-slot	16-bit	Not specified	Supplied by Racal Interlan	Etherscope software for protocol analysis and packet monitoring	Not specified	RJ-45	Extended distance support; high-performance claimed	\$495/Lifetime	Distributors and OEMs
Shiva Corp. Cambridge, Mass. (617) 252-6300	EtherPort SE/30T	Macintosh SE/30	8-bit	8K-byte RAM packet buffer	AppleTalk Phase 1 and 2, DECnet and TCP/IP-compatible	None	Not specified	RJ-45, AUI	None specified	\$299/5 years, repair or replacement	Distributors include Ingram Micro, Menisel, Tech Data and mail order
	EtherPort SET	Macintosh SE only	8-bit	8K-byte RAM packet buffer	AppleTalk Phase 1 and 2, DECnet and TCP/IP-compatible	None	Not specified	RJ-45, AUI	None specified	\$299/5 years, repair or replacement	Distributors include Ingram Micro, Menisel, Tech Data and mail order
	EtherPort IIT	Macintosh IIs with NuBus; half-slot	8-bit	8K-byte RAM packet buffer	AppleTalk Phase 1 and 2, DECnet and TCP/IP-compatible	None	Not specified	RJ-45, AUI	None specified	\$299/5 years, repair or replacement	Distributors include Ingram Micro, Menisel, Tech Data and mail order
	EtherPort LCT	Macintosh LC only; LC bus	16-bit	8K-byte RAM packet buffer	AppleTalk Phase 1 and 2, DECnet and TCP/IP-compatible	None	Not specified	RJ-45, AUI	FPU socket for optional math coprocessor	\$299/5 years, repair or replacement	Distributors include Ingram Micro, Menisel, Tech Data and mail order
	EtherPort IIsIT	Macintosh IIs only; PDS interface	8-bit	8K-byte RAM packet buffer	AppleTalk Phase 1 and 2, DECnet and TCP/IP-compatible	None	Not specified	RJ-45, AUI	FPU socket for optional math coprocessor	\$299/5 years, repair or replacement	Distributors include Ingram Micro, Menisel, Tech Data and mail order
Solectek Corp. San Diego (619) 450-1220	LAN-10BT	Parallel port for all PCs	8-bit	Not specified	Supplied but not specified	None	Not specified	Parallel port	External connection to parallel port; for laptop and notebook PCs	\$499/1 year	Distributors
South Hills Datacomm Pittsburgh (412) 921-9000	8-bit 10Base-T Adapter Card	Any PC; ISA bus; half-slot	8-bit	On-board processor	Comes with NetWare driver; packet driver for FTP Software, Inc's TCP/IP and NETBIOS driver	None	Not specified	RJ-45	None specified	\$345/2 years	Direct to end users
	16-bit 10Base-T Adapter Card	PC ATs and above; ISA bus; ¾-slot	16-bit	On-board processor	Comes with NetWare driver; packet driver for FTP's TCP/IP, and NETBIOS driver	None	Not specified	RJ-45	None specified	\$395/2 years	Direct to end users
	MicroChannel 10Base-T Adapter	PS/2s and compatibles with MCA; full-slot	16-bit	On-board processor	Comes with NetWare driver; packet driver for FTP's TCP/IP and NETBIOS driver	None	Not specified	RJ-45	None specified	\$395/2 years	Direct to end users
Thomas-Conrad Corp. Austin, Texas (512) 836-1935	TC5045-T Ethernet Adapter/AT	PC ATs and above; ISA bus; half-slot	16-bit	DMA with bus mastering; optional boot ROM	NetWare drivers supplied	None	LEDs for activity, collisions and link integrity; software for NetWare V. 2.1+	RJ-45	Selectable interrupts; supports concurrent IPX and TCP/IP sessions	\$395/2 years	Resellers
	TC5045-TIO Ethernet Adapter/AT	PC ATs and above; ISA bus; half-slot	16-bit	DMA with bus mastering; optional boot ROM	NetWare drivers supplied for 286/386 servers; ODI workstations	None	LEDs for activity, collisions and link integrity; software for NetWare V. 2.1+	RJ-45, AUI, BNC	Selectable interrupts; supports concurrent IPX and TCP/IP sessions	\$449/2 years	Resellers
3Com Corp. Santa Clara, Calif. (800) 638-3266	EtherLink II TP	Any PC; ISA bus; half-slot	8-bit	Multiple host access methods; uses PC's processor; 8K-byte RAM packet buffer	3Com NDIS drivers and NetWare drivers supplied on disk	None	2 LEDs for link integrity and network activity	RJ-45, AUI	Supports prestandard hubs, extended distances	\$345/Lifetime limited warranty	National dealers, distributors, VARs and OEMs
	EtherLink 16 TP	PC ATs and above; ISA bus; full-slot	16-bit	Shared memory; 64K-byte RAM buffer; tuned LAN Manager and NetWare drivers	Specially tuned drivers for LAN Manager and NetWare	None	2 LEDs for link integrity and network activity	RJ-45, AUI	Supports prestandard hubs, extended distances	\$479/Lifetime limited warranty	National dealers, distributors, VARs and OEMs
	EtherLink/MC TP	PS/2s with MCA; full-slot	16-bit	Shared memory; 16K-byte dual ported RAM buffer	Specially tuned drivers for LAN Manager and NetWare	None	2 LEDs for link integrity and network activity	RJ-45, AUI	Supports prestandard hubs, extended distances	\$495/3 years, if registered and in same PC	National dealers, distributors, VARs and OEMs
	EtherLink/NB TPX	Macintosh IIs with NuBus; full-slot	32-bit	64K-byte RAM packet buffer; 32K-byte ROM for autoconfiguration	Apple's standard EtherTalk driver; TSSnet PacerLink/CommUnity-Mac for VAX	None	6 LEDs for power, polarity, heartbeat, link integrity and signal quality	RJ-45, AUI	Supports prestandard hubs, extended distances	\$670/Lifetime, limited	National dealers, distributors, VARs and OEMs
	EtherLink/MC 32 TPX	PS/2 models with MCA; full-slot	32-bit	DMA with bus mastering	Apple's standard EtherTalk driver; TSSnet PacerLink/CommUnity-Mac for VAX	None	6 LEDs for power, polarity, heartbeat, link integrity and signal quality	RJ-45, AUI	Supports prestandard hubs, extended distances	\$495/Lifetime, limited	National dealers, distributors, VARs and OEMs

AFP = AppleTalk File Protocol  
 AUI = Attachment unit interface  
 DMA = Direct memory access  
 EEPROM = Electrically erasable programmable read-only memory  
 EISA = Extended Industry Standard Architecture  
 FPU = Floating-point coprocessor  
 FPU = Floating-point unit

IPX = Internetwork Packet Exchange  
 ISA = Industry Standard Architecture  
 MCA = Micro Channel Architecture  
 NCP = Novell's NetWare Core Protocol  
 NDIS = Microsoft's Network Driver Interface Specification  
 NIC = Network interface card  
 NOS = Network operating system

ODI = Open Data-Link Interface  
 PC-NFS = Sun's Personal Computer-Network File System  
 PDS = Processor direct slot  
 PROM = Programmable read-only memory  
 SCSI = Small Computer System Interface  
 SNMP = Simple Network Management Protocol  
 VAR = Value-added reseller

This chart includes a representative selection of 10Base-T adapter cards. These vendors may offer other adapter cards, and other vendors not included may offer a full range of products.

SOURCE: NEWPORT CONSULTING, SCITUATE, MASS



## 10Base-T adapter cards (continued from page 69)

Company	Product	System and bus	8-, 16- or 32-bit	Architecture	Drivers	Management	Diagnostics	Connections	Other features	Price/warranty	Distribution
3Com (continued)	EtherLink NW1000-TP	Any PC; ISA bus; half-slot	8-bit	Includes NetWare boot PROM; choice of DMA, shared memory or programmed I/O host access methods	3Com drivers for NetWare 2.x and 3.x	None	6 LEDs for power, polarity, heartbeat, link integrity and signal quality	RJ-45, AUI	Supports extended distances	\$299/3 year	National dealers, distributors, VARs and OEMs
Tiara Computer Systems, Inc. Mountain View, Calif. (415) 965-1700	LANCard E*PC 10Base-T	PC XT, AT and compatibles; 8-bit PC XT bus; half-slot	8-bit	Not specified	Tiara-developed drivers supplied with product	None	Not specified	RJ-45, AUI	None specified	\$239/Lifetime	Distributors
	LANCard E*AT 10Base-T	PC AT and compatibles; ISA bus; half-slot	16-bit	Not specified	Tiara-developed drivers supplied with product	None	Not specified	RJ-45, AUI	None specified	\$279/Lifetime	Distributors
	LANCard E*MC 10Base-T	PS/2s and compatibles with MCA; full-slot	16-bit	Not specified	Tiara-developed drivers supplied with product	None	Not specified	RJ-45, AUI	None specified	\$349/Lifetime	Distributors
Top Microsystems Santa Clara, Calif. (408) 980-9813	TE-700E	Any PC; ISA bus; half-slot	8-bit	8K-byte packet buffer; shared memory; optional boot ROM	Supplied for most popular NOSs	None	Software included; LEDs also included	RJ-45, AUI	Western Digital 8003-compatible; selectable interrupts and I/O addresses	\$249/5 years	Resellers and distributors
	TE-800E	PC ATs and above; ISA bus; half-slot	16-bit	16K-byte packet buffer; shared memory; optional boot ROM	Supplied for most popular NOSs	None	Software included; LEDs also included	RJ-45, AUI	Selectable interrupts and I/O addresses	\$279/5 years	Resellers and distributors
	LanWay E-10T LC	Macintosh LC PDS	32-bit	64K-byte packet buffer	Compatible with Ethernalk LAN adapter; many others	None	Not specified	RJ-45, AUI	None specified	\$345/1 year	Unspecified dealers or direct
	LanWay E-10T NuBus	Macintosh II family	32-bit	64K-byte packet buffer	Compatible with Ethernalk LAN adapter; many others	None	Status LEDs	RJ-45, AUI	None specified	\$345/1 year	Unspecified dealers or direct
Western Digital Corp. Irvine, Calif. (800) 638-5323	EtherCard PLUS 10T	Any PC; ISA bus; half-slot	8-bit	Shared memory, 8K-byte packet buffer	Supplied Superdisk supports all popular NOSs	None	LEDs and supplied diagnostic software	RJ-45, AUI	Uses Western Digital chips for higher integration and performance	\$349/5 years	2-tier retail distribution
	EtherCard PLUS Elite16T	PC ATs and above; ISA bus; half-slot	16-bit	Shared memory, 16K-byte packet buffer	Superdisk supports all popular NOSs	None	LEDs and supplied diagnostic software	RJ-45, AUI	Uses Western Digital chips for higher integration and performance	\$349/5 years	2-tier retail distribution
	EtherCard PLUS Elite16 Combo	PC ATs and above; ISA bus; half-slot	16-bit	Shared memory, 16K-byte packet buffer	Superdisk supports all popular NOSs	None	LEDs and supplied software	RJ-45, AUI, BNC	All boards use Western Digital chips for higher integration and performance	\$399/5 years	2-tier retail distribution
	EtherCard PLUS 10T/A	PS/2 compatible with MCA; full-slot	16-bit	Shared memory, 16K-byte packet buffer	Superdisk supports all popular NOSs	None	LEDs and supplied software	RJ-45, AUI	All boards use Western Digital chips for higher integration and performance	\$399/5 years	2-tier retail distribution
Xircom, Inc. Calabasas, Calif. (818) 878-7600	PE10BT	Parallel port on all PCs and PS/2s; external	8-bit	32K-byte packet buffer; 256K-byte EEPROM configuration storage	Preconfigured for all popular NOSs	None	Loop-back and self-test capability	RJ-45	Fits in shirt pocket; supports standard and Starlan 10 hubs	\$595/2 years, 50% trade-in plan extra	Ingram Micro, Merisel and Tech Data
	Pocket Ethernet Adapter II	Parallel port on all PCs and PS/2s; external	8-bit	32K-byte packet buffer; 256K-byte EEPROM configuration storage	Preconfigured for all popular NOSs	None	Loop-back and self-test capability	RJ-45	Fits in shirt pocket; supports standard and Starlan 10 hubs; 25% faster than PE10BT	\$545/2 years, 50% trade-in plan extra	Ingram Micro, Merisel and Tech Data
	EE10BU	Parallel port on all PCs and PS/2s; external	8-bit	32K-byte packet buffer; 256K-byte EEPROM configuration storage	Preconfigured for all popular NOSs	None	Loop-back and self-test capability	RJ-45	Fits in shirt pocket; supports standard and Starlan 10 hubs	\$595/2 years, 50% trade-in plan extra	Ingram Micro, Merisel and Tech Data
Zenith Electronics Corp. Glenview, Ill. (708) 391-8000	LAN10TPC	Any PC; ISA bus	8-bit	Shared memory; optional boot PROM; 8K-byte RAM packet buffer	All popular NOSs	None	Two LEDs for link integrity and transmission	RJ-45, AUI	Signal polarity correction	\$345/1 year	VARs, system integrators and OEMs
	LAN10TMC	PS/2s or compatibles with MCA	16-bit	Shared memory; optional boot PROM; 16K-byte RAM packet buffer	All popular NOSs	None	Two LEDs for link integrity and transmission	RJ-45, AUI	Signal polarity correction	\$495/1 year	VARs, system integrators and OEMs
	LAN10E-MPC	Any PC; ISA bus; half-slot	8-bit	Shared memory; optional boot PROM; 8K-byte RAM packet buffer	All popular NOSs	None	Two LEDs for link integrity and transmission	RJ-45, AUI	Signal polarity correction	\$395/1 year	VARs, system integrators and OEMs
	LAN10E-MAT	PC ATs and above	16-bit	Shared memory; optional boot PROM; 16K-byte RAM packet buffer	All popular NOSs	None	Two LEDs for link integrity and transmission	RJ-45, AUI	Signal polarity correction	\$495/1 year	VARs, system integrators and OEMs

AFP = AppleTalk File Protocol  
 AUI = Attachment unit interface  
 DMA = Direct memory access  
 EEPROM = Electrically erasable programmable read-only memory  
 EISA = Extended Industry Standard Architecture  
 FPC = Floating-point coprocessor  
 FPU = Floating-point unit

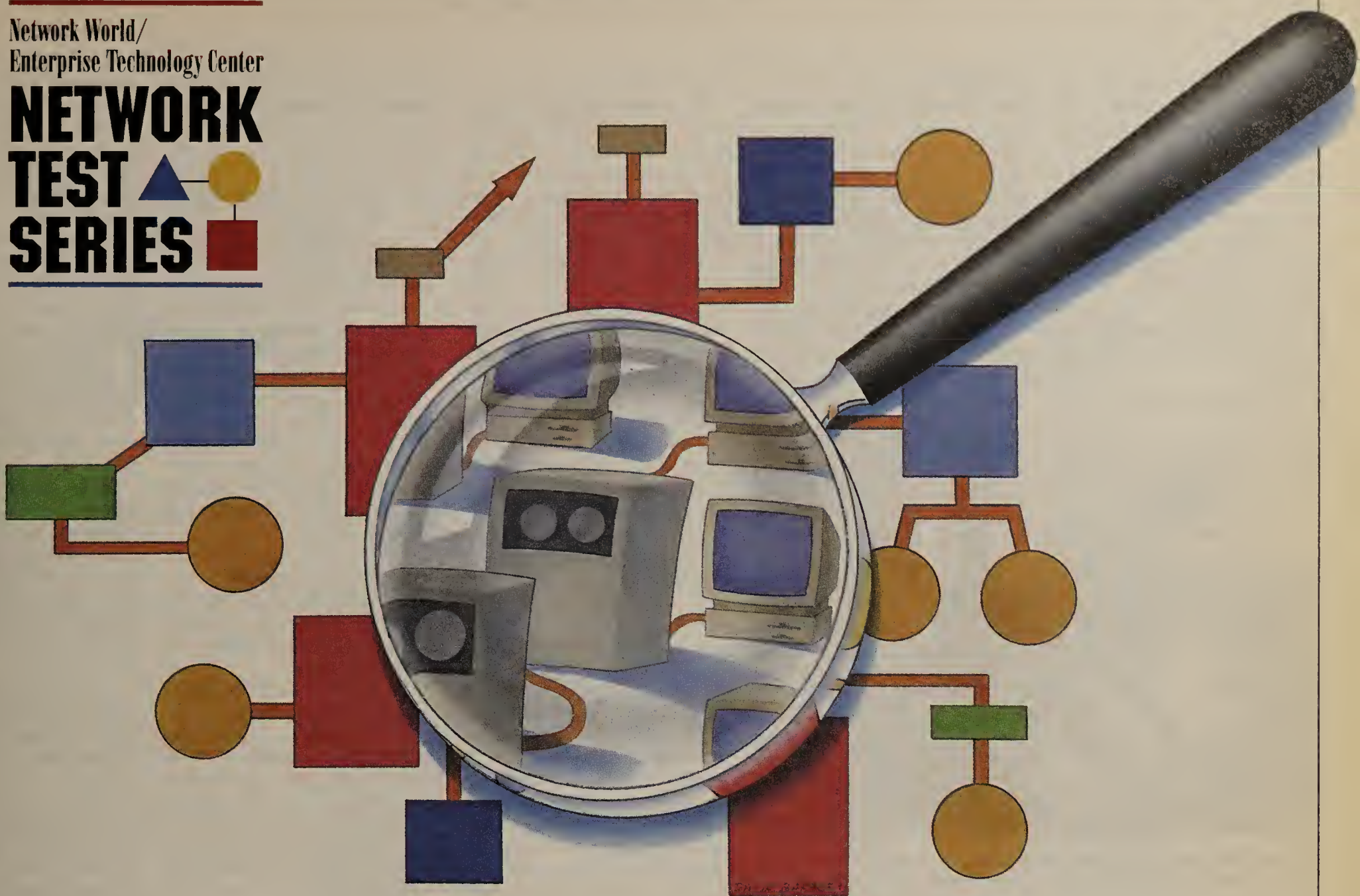
IPX = Internetwork Packet Exchange  
 ISA = Industry Standard Architecture  
 MCA = Micro Channel Architecture  
 NCP = Novell's NetWare Core Protocol  
 NDIS = Microsoft's Network Driver Interface Specification  
 NIC = Network Interface card  
 NOS = Network operating system

ODI = Open Data-Link Interface  
 PC-NFS = Sun's Personal Computer-Network File System  
 PDS = Processor direct slot  
 PROM = Programmable read-only memory  
 SCSI = Small Computer System Interface  
 SNMP = Simple Network Management Protocol  
 VAR = Value-added reseller

This chart includes a representative selection of 10Base-T adapter cards. These vendors may offer other adapter cards, and other vendors not included may offer a full range of products.

SOURCE: NEWPORT CONSULTING, SCITUATE, MASS.





# Examining what the cards say

**The latest  
NW/ETC  
test puts  
10Base-T  
adapter  
cards  
through  
their paces.**

Thirty years ago, a song made famous by Smokey Robinson and the Miracles told listeners, "Ya better shop around." That's exactly what network managers should be doing when buying 10Base-T adapter cards.

And unless certain features are vital to the network, managers should shop for the lowest price because the results of the latest *Network World*/Enterprise Technology Center, Inc. (ETC) Network Test series show there generally isn't a great difference in the performance of 10Base-T cards.

*Salamone is Network World's features writer.*

We tested 16-bit 10Base-T adapter cards from 22 vendors (see "The 22 that we tested," on page 75 for a complete list of the products) and found, with a few exceptions, all the cards deliver virtually the same performance. In fact, we found that the cards performed uniformly not only compared to one another, but also when they were tested in several stressful, although typical, building wiring environments.

#### **Robust response**

We tried to determine whether 10Base-T required perfect wiring and whether its performance degraded with interference.

Virtually all of the 10Base-T

products performed superbly, which leads to the following conclusion: If network managers had any doubt about the robustness of 10Base-T, the nearly identical performance of the cards should ease these concerns. The test thus gives network managers who are thinking about switching to a 10Base-T network added confidence in making that decision.

One strong reason to switch to a 10Base-T network is that companies may be able to use existing wiring to connect workstations to a local-area network. But there are several potential problems with this approach:

■ Installed wiring may exceed

the maximum length specification of the 10Base-T standard.

■ Wiring may pass close to sources of electronic noise, resulting in interference that might  
(continued on page 72)

By SALVATORE SALAMONE



(continued from page 71)

be acceptable for telephone conversations but would cause problems for data transmission.

■ Installed wiring in parts of a building may be of a lower grade than specified by the standard.

Our test measured the performance of the adapter cards under these conditions. With a few exceptions, the uniform results found in the testing demonstrates the resiliency of the 10Base-T standard.

We made great efforts to cause

of random-access memory. A Novell NE2000 Ethernet adapter card was used in the server. A thin-wire Ethernet cable connected the server to a Cabletron Systems, Inc. MMAC-3FNNB wire concentrator backplane, which included a TP-MIM 24 10Base-T module, a THN-MIM thin-wire Ethernet module and an IRM-2 intelligent repeater module.

This type of configuration — a server on a thin- or thick-wire Ethernet backbone with workstations connected to a concentra-

driver called IPX.COM.

Two cards deviated slightly from the standard driver configuration. One was the Cabletron E2010, which in addition to using IPX.COM, requires that a packet driver be installed as a device in the CONFIG.SYS file.

The other card was the Thomas-Conrad Corp. TC5045, which was the only card that specified the default use of a driver written to the Open Data-Link Interface (ODI) specification created by Novell.

ODI drivers load on top of a common link support layer, which permits additional ODI implementations of protocols, such as the Transmission Control Protocol/Internet Protocol, to be loaded and reside concurrently with Novell's Internetwork Packet Exchange (IPX) at the workstation.

After the drivers had been installed and the workstation rebooted, a technician logged onto the file server. Then a set of instructions was automatically executed on the workstation using Direct Technology, Ltd.'s AUTOMATOR mi scripting program. AUTOMATOR mi acted as a ghost operator and entered a sequence of commands at the DOS prompt. The script timed and stored how long it took to complete each section of the test sequence.

The instructions executed on the workstation included file transfers to and from the server, loading a 208K-byte executable file from the server and carrying out several NetWare commands.

the six representative cable configurations, whose characteristics were chosen because ETC staffers felt they reflected the conditions found in or near installations of existing phone wiring.

The time it took to perform the complete set of tasks is the measure of adapter card performance used in this test. A higher performance card would transfer the data in a shorter time since it would have a higher throughput.

If noise caused transmission errors in any of the wiring configurations, the file-transfer process would take longer than an unaffected transmission because packets with errors would have to be retransmitted.

### Examining the results

As mentioned at the start of this article, the 22 10Base-T cards tested were generally uniform performers.

With few exceptions, there were minimal differences — both across the various conditions and relative to one another — in the times required for each card to complete the tests. In general, the hurdles we imposed to simulate existing wiring conditions and the electrical noise environment seemed to pose few obstacles for the cards.

There were a few exceptions, however. The extended distance cable run proved insurmountable for the Kodiak Technology Raven-16 UTP and the Western Digital Corp. EtherCard Plus Elite 16T.

norm occurred in a few cards during the test. For example, when copying the files from the server to the workstation, some cards were slower compared to the average times, but there were a few speed demons.

The fastest card — based on the average time for complete transfer of the files on the six cable setups — was the 3Com Corp. Etherlink 16 TP, which at 181 seconds, was about 10% faster than the two slowest cards, which took 209 seconds. However, the 3Com card was only 3% faster than the overall average of all 22 cards.

When copying files from the server in the average of all six configurations, the two slowest cards were the Cabletron E2010 and the Kodiak Raven-16 UTP. Other slower than average cards included the D-Link Systems, Inc. DE-200 TP and the IMC Networks Corp. PCnic TP.

The Cabletron card's slower times may be related to the additional overhead of its separate packet driver, according to ETC staffers.

Notably, the other card that varied from the normal driver setup, the Thomas-Conrad TC5045, turned in the fastest average time on the copy-to-server test. ETC staffers speculate that the ODI drivers might have had some impact in this fast performance.

In this portion of the test — the copying of files from the server sequence — the slowest card was again the Cabletron offering.



PHOTO ©1991 PAUL S. HOWELL

**Project Directors Mike Moyer, ETC Network Test Series manager (sitting), and Salvatore Salamone, Network World's features writer.**

problems in the cards, but nothing seemed to degrade their performance (see "Taking it to extremes," page 76).

### Test bed and methodology

The Network World/ETC 10Base-T test was designed to examine how well 10Base-T network interface cards perform when used in typical office wiring environments.

There is a tremendous variation in the quality of unshielded twisted-pair wiring used in different buildings as well as in the installation techniques used. These variations could degrade the performance of a 10Base-T network. For example, if electrical noise causes errors in transmission, data packets might have to be sent numerous times.

To examine the performance of these cards under possible cable and installation situations, we attempted to create a test bed that would simulate some of the conditions that might exist on or around a cable run.

The cards were tested under six wiring configurations (see Figure 1, this page). Several tests subjected the unshielded twisted-pair wiring to high levels of electronic noise; and in one configuration, the wiring exceeded the maximum length specified in the 10Base-T standard.

The test bed consisted of a file server running Novell, Inc. NetWare Version 3.11, one workstation, a wiring concentrator and a punchdown block (see Figure 2, page 76).

The server was a Dell Computer Corp. 333D PC with a 100M-byte hard disk drive and 8M bytes

tor or hub using unshielded twisted-pair wiring — was chosen because it was considered to be fairly typical.

The workstation was a Dell 210 PC, with a 100M-byte hard drive and 4M bytes of RAM. The workstation ran Microsoft Corp.'s MS-DOS Version 3.33 as its disk operating system.

For each test, an adapter card was installed in the workstation and the workstation was connected to the punchdown block using a four-pair, 24-gauge Level 3 cable, which meets the 10Base-T specifications.

However, in one stress test, 22-gauge Level 1 cable, designed for plain old telephone service and low-speed data, was used instead of the Level 3 cable. Although 22-gauge cable is theoretically better than 24-gauge because of its additional copper, the electrical characteristics of Level 3 cable are considerably better than Level 1 because of the quality of the insulation and the grade of copper used.

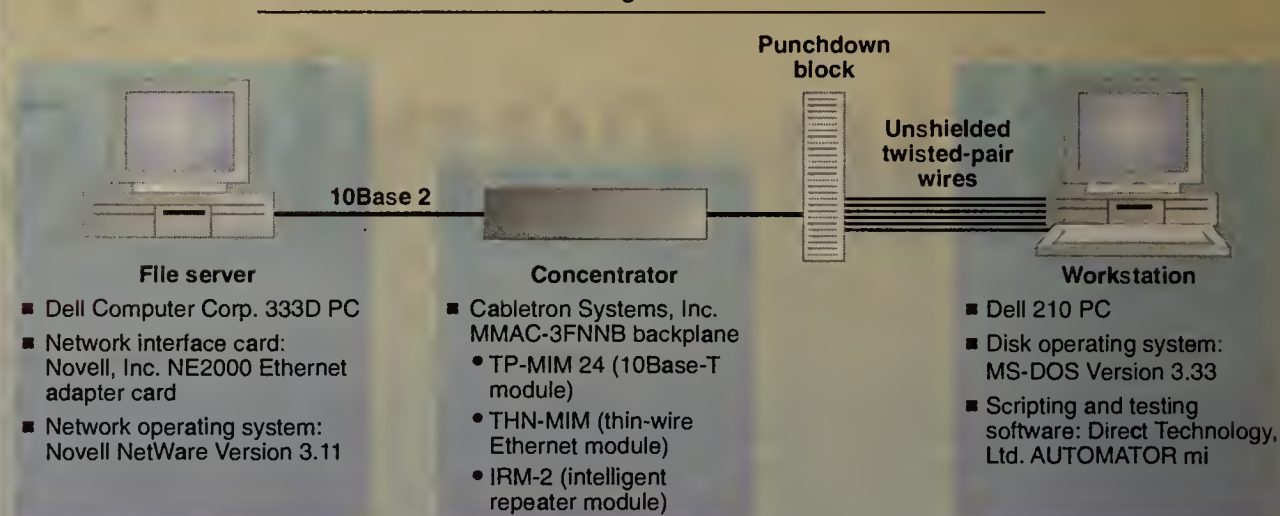
Each card was installed in the workstation in accordance with the manufacturer's instructions. The factory default settings for interrupt channels and I/O addresses were adjusted only when necessary to make the card operate correctly in the Dell 210 PC.

Next, when provided, the vendor's diagnostic program was run to test the card. Any required software-configurable changes were made at this point.

Finally, the appropriate NetWare drivers were copied to a hard disk directory set up to run Novell's WSGEN program, which generates the workstation shell

## 10Base-T adapter card test configuration

Figure 1



The test bed was designed to evaluate how well different vendors' 10Base-T adapter cards, installed in the workstation, would work in 6 various wiring configurations. Each configuration tested whether a card's performance degraded when the wires were placed under different electronic noise conditions.

GRAPHIC BY SUSAN SLATER

SOURCE: ENTERPRISE TECHNOLOGY CENTER, INC., HOUSTON

The four types of file transfers performed were:

■ Copying a large file (10M bytes) from the file server to the workstation's local hard disk drive.

■ Copying a small file (40 bytes) from the server to the hard drive 15 times.

■ Copying a large file (10M bytes) from the hard drive to the file server.

■ Copying a small file (40 bytes) from the hard drive to the server 15 times.

The script was run for each of

The Raven-16 always returned an error message stating "A file server could not be found" upon loading the NetWare shell. While the Elite 16T was able to sporadically connect to the file server, it wasn't able to complete the tests.

ETC staffers used a Spider Systems, Inc. SpiderAnalyzer P320 to investigate these two cases. Examining the packets revealed that while the request to connect reached the file server, the cards were unable to "hear" the response back from the server.

Other deviations from the

It was 25% behind the Thomas-Conrad card and 19% slower than the overall average. Here again, the Cabletron card's slower times may be related to the separate packet driver.

There were no differences to speak of among the 22 cards in the last two test sequences — the loading of an executable file and the execution of the NetWare commands.

It must be stressed that, except for the E2010, no card performed consistently better or worse than

(continued on page 75)



# Pulling management strings with TCP/IP

*Third-party management applications are helping TCP/IP users control their multivendor networks.*

Ask network managers with responsibility for multivendor TCP/IP networks what they want above all else — besides a well-deserved vacation — and you'll hear the same answer repeatedly: better tools to do their job. The tools they have in mind are Transmission Control Protocol/Internet Protocol network management applications.

In the absence of full-blown Open Systems Interconnection, TCP/IP has become the de facto standard for multivendor inter-networking, allowing organizations to connect dissimilar computers and LANs. Managing these sprawling, enterprisewide networks has been made easier by the addition of the Simple Network Management Protocol (SNMP), which promises to enable network devices from different vendors to communicate without a separate set of management tools for each device.

Some sophisticated SNMP-based net management systems are currently available. Still, users are often left to write their

*Smalley is a Boston-based free-lance writer.*



own network management applications or work within the constraints of vendor-specific applications.

What users really want is a single platform from which to manage their multivendor TCP/IP environment and comprehensive applications that perform common management tasks regardless of which vendor supplied the devices being managed.

The current phase in the evolution of TCP/IP network management involves making third-party net management applications possible.

"The industry is headed to-

ward platform-oriented network management, with third-party vendors providing applications," says Steven Morgenthal, senior consultant for network management with General Logistics International, Inc., a consulting firm based in Union, N.J.

Certain platforms, such as Sun Microsystems, Inc.'s SunNet Manager and Hewlett-Packard Co.'s OpenView, are gaining popularity — enough so that some companies are venturing to provide third-party applications for these platforms. But until third-party management applications become widely available, network

management systems will not live up to the promise of SNMP to provide multivendor network management.

Although SNMP is a standard management protocol, vendors have customized it by developing proprietary Management Information Base (MIB) extensions to help manage the unique aspects of their products.

This has led networking vendors to offer their own management systems to provide comprehensive management for their products. However, those management systems that do not also

*(continued on page 74)*

By ERIC SMALLEY



(continued from page 73)

support proprietary MIB extensions from other vendors cannot offer the same level of management for other devices on the network.

Even without proprietary MIB extensions, network managers need applications that help make sense of the wealth of information SNMP provides and help automate control of the network.

"Users are sick of hearing about SNMP, MIB extensions and mechanisms," says David Mahler, vice-president of marketing for Remedy Corp. in Sunnyvale, Calif. "Enough discussion about protocols."

Remedy moved to the forefront of the fledgling third-party network management application market last month by introducing a trouble-ticketing application based on SunNet Manager.

Trouble-ticketing applications help automate network administration and maintenance. Remedy's application, called Action Request System (ARS), allows end users to submit problems to the system through electronic mail, Mahler says. ARS can also receive notification of problems directly from SNMP traps on devices. These traps are the means by which network devices send alarms to SNMP management systems without first being polled.

After receiving notification of a problem, ARS generates a trouble ticket and alerts network operators via E-mail. The operators can then access a data base, supported by ARS, that maintains information on past problems and how they were solved (see graphic, this page).

ARS was preceded by other third-party vendors' application efforts. General Logistics' Morgenthal says the first independent software vendor to offer an application for another company's management platform was Intelligent Networks Applications, Inc. (INA), based in Menlo Park, Calif. INA introduced an auto discovery application for SunNet Manager in December. Auto discovery applications discern network topologies by observing net traffic and recording the different types of devices residing on the network.

This week, INA is expected to announce a merger with Proxar Technologies, Inc. Proxar's founders include Ching-Fa Huang, who helped develop HP's distributed operating system, called Distributed HP-UX. The new company is expected to be a major third-party supplier of network management applications.

The combined INA/Proxar unit and any other entrants into the emerging third-party market for management applications will face high expectations from network managers who have been tied to specific vendors' offerings.

"I want applications that I can port to multiple platforms — ap-

plications that are not sensitive to operating systems or hardware," says John Payne, communications architect with DHL Airways, Inc.

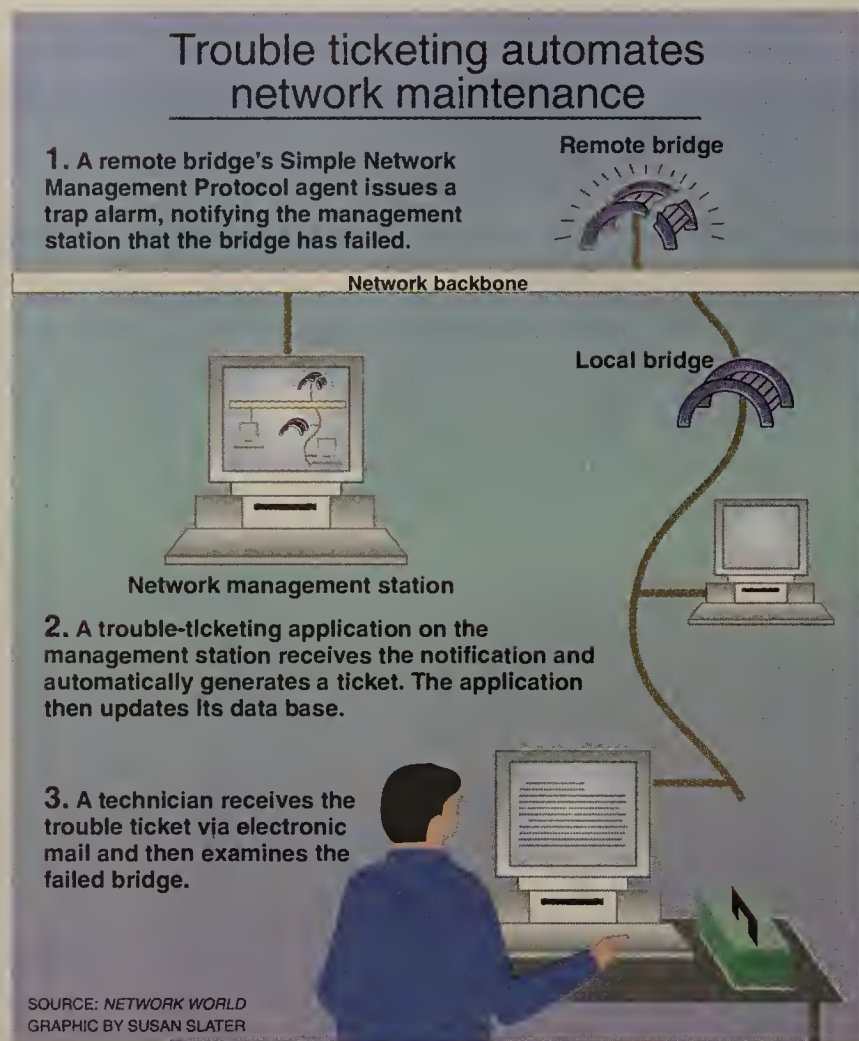
### Signs of progress

It might be a while before the requirements of users such as Payne will be met. However, just having applications available that are independent of management platforms marks a significant development in network management.

DEC Management Control Center, AT&T's Accumaster, OpenView and SunNet Manager, has been established with the help of these vendors' large customer bases.

However, users should be aware that, for the most part, each of these platforms is designed to manage its vendor's own net software. Support for TCP/IP management via SNMP has been, or is in the process of being, added on.

The second tier contains two



Net management systems have progressed from the original diagnostic tools — network analyzers — which allow technicians to tap into a segment and decode protocols.

Network monitors then followed and allowed managers to track statistics for network traffic on one or more segments.

The most recent development in network management platforms is the SNMP-based integrated net management system, which provides managers with an overall view of their network and allows them to set thresholds for network parameters.

Now integrated management systems are emerging as the platforms for management applications. Working with SNMP, these systems can manage a range of network devices from different vendors.

Before third-party vendors can offer applications that make SNMP management systems easier to use, a limited number of management platforms have to emerge as the dominant, or even standard, platforms.

### Platform contenders

The current platform market can be divided into two tiers. The first one, comprising IBM's NetView, Digital Equipment Corp.'s

distinct groups. The first, vendors whose primary focus is on aspects of networking other than management, is expected to willingly leave the management platform market, analysts say.

These companies developed management platforms to provide the level of management required for their other networking products — a level unavailable to date from management platforms offered by other vendors. These platforms are referred to as independent element managers because their primary focus is on managing a particular type of device, such as a router.

"There's going to be a shake-out," says John McConnell, vice-president and principal analyst with Infonetics Research, Inc., a market research firm in San Jose, Calif. "Companies like Cisco [Systems, Inc.] and Wellfleet [Communications, Inc.] had to have SNMP management stations. They will gladly get out, and [third-party software companies such as] Remedy will give a lot of those vendors a way out."

Vendors in the other group of the second tier are planning to stay in the multivendor network management market. These include Concord Communications, Inc., Network General Corp. and SynOptics Communications, Inc.

The management platforms from these vendors are based on distributed architectures and include capabilities such as protocol analysis.

Other vendors in this group, including Hughes LAN Systems, Inc. and Lexcel, Micro Technology, Inc.'s subsidiary, have bolstered their products with private SNMP MIB extensions for network devices from other vendors.

Despite the significant number of vendors that have large investments in network management platform product lines, analysts say the trend is toward fewer management platforms on the market.

The large number of network equipment vendors represented at Remedy's press conference announcing ARS last month lends weight to the analysts' arguments.

Industry acceptance of a single, standard management platform would give the third-party management software market an even bigger push. Not only would network managers be able to purchase network management platforms based on criteria such as price/performance and added value rather than compatibility, but users would also be able to choose from a wider range of applications.

While universal acceptance of such a platform is unlikely, the Open Software Foundation, Inc.'s Distributed Management Environment (DME) and Unix International, Inc.'s UI Atlas distributed computing specification could provide some measure of standardization.

Both the DME and UI Atlas support SNMP and take an object-oriented approach to network and systems management. With object-oriented technology, network devices are represented by objects. These objects are acted on by management applications according to the type of object they are, instead of the unique characteristics of the device.

Object-oriented technology will help foster the third-party network management application market. Even if no single platform emerges as a standard, the object-oriented technology each platform uses is expected to become standardized.

However, the acceptance of the DME and the growth of the third-party applications market are much like the chicken and the egg dilemma, McConnell says.

"Software vendors are waiting to see if the DME takes off, but DME acceptance is partly tied to available applications," he notes.

Even if the DME is widely accepted, there probably won't be a sudden burst of management application introductions, McConnell says. There could be a number of product introductions marking the establishment of the third-party market at the Communication Networks '92 conference in Washington D.C. in Janu-

ary, he says.

Applications from the third-party market are expected to take a broad approach to automating network management rather than falling into one of the five traditional network management categories of fault, configuration, accounting, performance and security. The applications will handle multiple tasks spanning these categories.

MIB extensions to the SNMP standard could also give rise to "vertical integration" applications, says Jeffrey Case, president of SNMP Research, Inc. and one of the authors of the SNMP protocol.

For example, there will be applications designed around the Fiber Distributed Data Interface MIB and applications designed around Switched Multimegabit Data Service subscriber management, Case says. These applications will integrate management tasks from multiple protocol layers for a specific environment.

Network managers have been waiting in anticipation for these types of applications.

"Task- or function-specific packages at a reasonable price is what we've been looking for," says George Pavel, group leader for the Computation Engineering Group at the Lawrence Livermore Laboratory in Livermore, Calif.

Some users said they plan to incorporate these task-oriented applications in larger network management systems.

"We're looking internally at building a master system [spanning] many sites around the world," DHL's Payne says. "We're looking for as many off-the-shelf packages we can find [to build it]."

### Off the shelf

According to General Logistics' Morgenthal, those off-the-shelf packages are likely to fall into three categories: trouble-ticketing applications for multi-vendor environments, such as Remedy's ARS; performance management applications with the sophistication to identify possible problems before they affect end users; and applications that, whether through scripting or artificial intelligence, observe network events and take action automatically to address problems, instead of merely alerting network operators.

Users have high expectations for trouble-ticket applications because they have existed in the IBM environment for some time. Trouble-ticket applications that can alert network operators via E-mail are critical, says Scott Bradnor, a member of the Internet Engineering Task Force and network manager at Harvard University in Cambridge, Mass.

However, not many current trouble-ticket applications have this capability.

"There's been a stunning dearth of them," Bradnor says.



Trouble-ticketing applications are also limited by the capabilities of the network monitors that pass information to the applications, he adds.

"I'm not keen on the current generation of network monitors automatically generating tickets," Bradnor says. "They don't have much intelligence. If a link goes down, they tell me every station on the other side is down."

Paging is another important capability for trouble-ticketing applications to have, says Mark Tillotson, corporate network manager for Conner, Inc. in San Jose, Calif. Instead of sending an E-mail message, an application with this capability would dial the network manager's pager, thus extending notification beyond the network itself.

Most net management applications today fall under the performance monitoring category. Generally, performance monitoring is a capability that users want to check off a list when evaluating vendors, SNMP Research's Case says.

However, few applications available today can identify a given set of conditions as indicating one of several common network problems.

The third category of applications — ones that respond to network problems automatically — require a high level of sophistication. For example, an automated application must be able to correlate network events.

#### Future possibilities

Such sophisticated management capabilities have some network managers pondering the possibilities.

"I would like to see an artificial intelligence system that can listen to the network and learn average traffic patterns," says Lori Steinmetz, data network manager for the Boston-based Christian Science Publishing Society. Such an application would be able to cross-reference data in the event of an alarm.

For instance, if the application observed a high collision rate, it would check bandwidth utilization, Steinmetz says.

One of the most important reasons to boost the level of intelligence of network management applications is to allow networks to be monitored and maintained by operators with a lower skill level than the network experts who originally built the net.

"Somebody's got to get it together and make network management systems run-able by laymen," Tillotson says.

Users also need the network equivalent of executive information systems, according to Tillotson. This would allow the network manager's boss to query the network management system directly for the status of net, he says.

One goal of applying expert systems technology to network management is to have management systems that can recognize the priority of a given wide-area link or other network element, what kind of access technicians have to the element and how priority and access change according to the time and date, Bradnor says.

But these capabilities will come at a price. Much of the technology needed to create such sophisticated applications is still too expensive to develop into affordable products. However, it won't be long before network managers will be able to build comprehensive customized TCP/IP management systems using off-the-shelf applications, rather than buying into a specific vendor's view of net management. **■**

## Examining what the cards say

*continued from page 72*

the others. And besides those cards noted above, which either had problems or performed exceptionally well, the adapters rarely deviated from the average time.

#### Features galore

Although there's very little that distinguished one board from another in these tests, there are other factors to consider when choosing 10Base-T adapters. For some users, features may be the factor that determines which card to buy. Below are some features to consider.

■ **Ease of setup.** Some situations will require changing the default settings of the adapter cards. More often than not, this means opening the computer in order to get at an array of jumpers and switches on the 10Base-T board. If the jumpers are not well labeled, this process also involves searching for the manual and deciphering diagrams.

Ideally, a card would be completely software-configurable to avoid this situation. A few of the cards tested have this level of sophistication. In particular, the National Semiconductor Corp. EtherNODE 16AT-T setup software makes the choice of an interrupt channel/base address combination easy.

The Western Digital Elite 16T has a single jumper block that allows the user to select from two preset configurations or a software set combination. The program supplied for the setup is simple but effective. The Elite 16T also automatically switches to whichever media port is active — 10Base-T or attachment unit interface (AUI).

Hewlett-Packard Co.'s EtherTwist PC Link also keeps the switches to a minimum. A single dual in-line package (DIP) block controls the base address and link beat enable (the link beat indicator tells the user that a physical connection has been established with the concentrator). The interrupt channel is determined by the driver option selected during the NetWare shell generation.

The IMC Networks PCnic TP uses a similar approach and permits the user to override the interrupt settings in IPX.COM with a DOS SET command.

Some cards that have many jumpers do provide a measure of relief by labeling them well enough to avoid the documentation hunt.

Racal InterLan, Inc.'s NI6510-10BT stands out in this respect, grouping all the key jumpers in one area of the circuit board and clearly showing their meanings. D-Link's DE-200 TP, Everex Systems, Inc.'s Speedlink/PC16TP, Intellicom, Inc.'s TPAIR-16T and the Tiara Computer Systems, Inc. Lan Card/E\*AT 10BT all get

This test was conducted by Houston-based Enterprise Technology Center, Inc., which showcases high-end networking and systems integration products and services, conducts research, and tests network systems for its clients and for *Network World* as part of the Network Test Series.

A comprehensive report on 10Base-T, including the results published in this article and additional findings, can be purchased by calling (800) 950-LANS. Ask for Special Report #5.

high marks as well for clearly labeling jumpers.

Several vendors place the DIP switch blocks for several features at the top of the card, where they can be changed without removing the card. Tested products that offer this feature include: CNet Technology, Inc.'s CN600E, David Systems, Inc.'s Ether-T AT, Gateway Communications,

Inc.'s G/EtherTwist AT and Standard Microsystems Corp.'s SMC3016TP.

■ **Documentation.** Another factor that will determine how quickly a user can install and troubleshoot a network interface card is the quality of the documentation it comes with.

Many vendors' printed manuals could (continued on page 76)

## The 22 that we tested

This latest test in the *Network World*/Enterprise Technology Center, Inc. Network Test Series evaluated 16-bit, Industry Standard Architecture-bus, 10Base-T network interface cards. The manufacturers and adapter card models tested were:

- Accton Technology Corp. EtherPair-16T (EN1625).
- ADI Systems, Inc. AQ-PCE-116TP.
- Cabletron Systems, Inc. E2010.
- CNet Technology, Inc. CN600E.
- D-Link Systems, Inc. DE-200 TP.
- David Systems, Inc. Ether-T AT.
- Everex Systems, Inc. Speedlink/PC16TP (EV2027).
- Gandalf Data, Inc. LANLine/AT (6213A1).
- Gateway Communications, Inc. G/EtherTwist AT 16-bit.
- Hewlett-Packard Co. HP EtherTwist PC Link (#272-47A).

- IMC Networks Corp. PCnic TP 16-bit.
- Intellicom, Inc. Quicknet 3000-TPAIR-16T.
- Kodiak Technology Raven-16 UTP.
- National Semiconductor Corp. EtherNODE 16AT-T.
- NetWorth, Inc. EtherNext 16-bit UTP (UTP16RWC).
- Racal InterLan, Inc. NI6510-10BT.
- Standard Microsystems Corp. SMC3016TP.
- Thomas-Conrad Corp. TC5045 Ethernet Adapter/AT.
- 3Com Corp. EtherLink 16 TP (3C507TP).
- Tiara Computer Systems, Inc. LANCard/E\*AT 10BT.
- Ungermann-Bass, Inc. Access/PC-16 (PC1100).
- Western Digital Corp. EtherCard PLUS Elite 16T (WD8013EW).

— Salvatore Salamone



## UN-FRACTIONAL T1

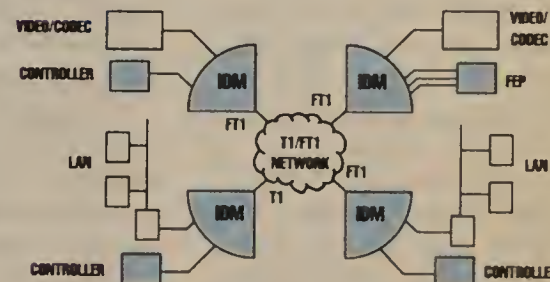
### SCITEC IDM

Intelligent Digital Multiplexer

Until now Fractional T1 products had "fractional" features to match. The SCITEC IDM has all the features you'd never expect to find in T1 and FT1 access equipment.

Intelligence and features to create networks which provide integrated solutions.

- Up to 8 DTE ports
- N x 56, 64 data rates
- Hot-insertable cards
- Effortless user-interface
- ESF monitoring
- Comprehensive BERT
- Integrated CSU
- Remote configuration
- CEPT compatible



Discover the IDM, a T1/FT1 access product from a company committed to wide-area networking... worldwide.

Call Now...1-800-343-0928  
Or Fax...1-401-849-8020



Scitec Communication Systems Limited • North America • Europe • Australia • Asia Pacific



(continued from page 75)

stand improvement in both content and diagrams. For instance, the Intellicom guide relies on X's and O's in its jumper setting diagrams, which are nearly incomprehensible for even an experienced user. And virtually every vendor's guide ultimately refers the user to the network operating system manual or makes the user scan one or more README files on the driver disk.

### Helpful documentation

A few vendors do provide fairly detailed printed information on driver installation for several different network operating systems. For example, manuals from David Systems, Gateway Communications and Ungermann-Bass, Inc. spell out the steps for both NetWare and Microsoft's Lan Manager.

The best documentation comes with the Everex, Gandalf Data, Inc., National Semiconductor and NetWorth, Inc. cards. These guides are clearly written and well organized. Each contains a helpful index and glossary along with a wealth of general information on networking, including design considerations and limitations.

Standard Microsystems' README is an actual program that accesses an on-line version of the documentation.

■ **Diagnostics and troubleshooting.** A combination of a diagnostic program for the hardware and LEDs on the card itself can aid in troubleshooting.

Many vendors provide a simple diagnostic program with their adapter. Typically, the program will do loop-back, adapter memory and echo tests if another card of the same type is available on the network to answer. It will also tell the user whether the adapter passed or failed.

The diagnostic applications from Intellicom, National Semiconductor and Western Digital stood out as above average. They are easy to use and present their results in a straightforward format.

Indicator LEDs are usually next to the RJ-45 socket and AUI port on a card. They can show several types of information that aids in tracking down problems.

The most basic function is a link beat indicator, which when lit shows that a physical connection has been established with the concentrator. Another pair of LEDs might reflect the level of receive and transmit traffic. Other indicators may show collisions on the line and indicate when a card or port on the concentrator is malfunctioning, or "jabbering" as it is called.

The combinations of LED indicators that vendors provide vary greatly. The important thing to have on a card is one or more indicators for the particular statuses that you need to monitor.

Besides these basic features,

an individual adapter may provide several other options. This is particularly true when it comes to compatibility. Here are the compatibility features offered by some of the 22 card vendors:

■ **Novell NE2000 compatibility.** The NE2000 is Novell's standard 16-bit, Industry Standard Architecture bus, thin-wire Ethernet card. Many applications and drivers come with built-in support for the card.

A 10Base-T adapter card that is compatible with the NE2000

along with the 10Base-T and AUI ports.

■ **Bus/CPU clock speed and zero wait state.** Certain older AT-class personal computers can have timing conflicts with adapters due to the way the bus is accessed.

The zero wait state mode provides the best performance from a card, but some older personal computers may be incapable of working in that mode. Most vendors offer a jumper or two that can add wait state or compensate

stance, if a pre-10Base-T Ethernet concentrator is used, the link beat must be disabled on all connected adapter cards.

Sometimes the choice of an adapter card comes down to the special offerings of a particular vendor.

Features are noted in this section primarily for their uniqueness. In most cases, these options were not evaluated because they fell outside the parameters of this test.

■ **Extended distance.** As noted above, nearly all of the cards tested were able to operate on a 150-meter cable length, which exceeds the 802.3 specification by 50 meters.

However, both NetWorth and 3Com claim that their cards can attain distances up to 200 meters, provided that users employ their respective manufacturers' hubs, which support extended distance and high-grade wiring.

■ **Use of shielded twisted pair.** The Cabletron and 3Com adapters can match the higher impedance rating of IBM Type 1 shielded twisted-pair cabling. Since token-ring LANs typically operate over Type 1 cable, this feature, in theory, would permit a user who is moving to 10Base-T from a token-ring environment to maintain the existing wiring investment.

■ **Large IPX packets.** Standard Microsystems has created drivers for its line of Ethernet cards that send and receive larger — 2K- or 4K-byte vs. the normal 1K-byte — IPX packets. This is done while still putting legal Ethernet packets on the line.

To take advantage of this larger packet size feature, a Standard Microsystems card must also be installed on the file server to

which the workstation is communicating.

### Final advice

The features above allow net managers to pick a card based on special needs. If special situations do not exist, net managers can simply select a 10Base-T adapter card based on price.

Furthermore, if there was any hesitation to select 10Base-T because of fear that the technology was unstable, these tests should help allay those fears.

This trial showed that almost all of the cards tested were not affected by the types of interference found in most office environments. This result points to technical advances on three fronts: the cards themselves, the wire and installation techniques.

Where problems may still occur is in older facilities where wire routing and, therefore, length is unknown and where severe deterioration in the wire or insulation is likely to have occurred. Many cable installers and systems integrators use a rough rule of thumb that if the wire has been installed for more than five years, it should be tested before attempting to use it for something other than voice traffic.

Overall, the test found that no one card is significantly better than any other. So as Smokey Robinson said, "Shop around."

Check the list prices in the companion 10Base-T Buyer's Guide article beginning on page 43. Use these numbers as a starting point. Call around for price quotes — many vendors offer discounts on volume purchases. And make sure you check several resellers; they often offer discounted prices compared to the list prices. ■

## Test conditions

Figure 2

Cable number	Length (in meters)	Conditions
1	16.5	Level 3 unshielded twisted-pair wire from workstation to punchdown block provides a baseline reference for other tests.
2	148.8	Level 3 unshielded twisted-pair wire length exceeds specifications of the 10Base-T standard.
3	67.1	Level 3 unshielded twisted-pair cable length is OK, but bulk of cable coiled near end.
4	65.8	Level 3 unshielded twisted-pair cable runs alongside fluorescent lights (a common source of electronic noise).
5	65.8	Used lower grade wire (Level 1 vs. Level 3) than specified by the 10Base-T standard.
6	68.6	Level 3 unshielded twisted pair with multiple cross-connects at the punchdown block.

Each adapter card was tested under the wiring conditions listed above to determine whether electronic noise, lower grade wire or wire that is longer than the 100 meters specified by the 10Base-T standard would cause a performance problem.

GRAPHIC BY SUSAN SLATER

SOURCE: ENTERPRISE TECHNOLOGY CENTER, INC., HOUSTON

will allow a user to continue to use software written for the NE2000, regardless of whether the user has unshielded twisted pair or thin-wire Ethernet as the cabling media.

Accton Technology Corp.'s EtherPair-16T, CNet Technology's CN600E, D-Link's DE-200 TP, Intellicom's TPAIR-16T and National Semiconductor's EtherNode 16AT-T were all tested using Novell's NE2000 driver, and they all operated without problems.

Performance didn't differ much from that obtained with each vendor's own driver. In fact, the Intellicom, CNet Technology and National Semiconductor models specify the NE2000 as their normal driver.

■ **Other Ethernet media.** An AUI port, combined with the appropriate transceiver, will let an adapter connect to a thin-wire (10Base2) or thick-wire (10Base5) Ethernet cable.

The majority of cards tested provided the standard DB-15 AUI connector. Usually, this feature is enabled by shifting a set of eight jumpers on the adapter board.

If the type of media will be changed often, the best choice is a board such as Cabletron's E2010, which has a single switch, or Western Digital's Elite 16T, which automatically senses the media being used.

Thomas-Conrad also offers a version of its adapter card called the TC5045-TIO that has a built-in thin-wire Ethernet connector

for other timing problems.

■ **Link Beat.** Unshielded twisted-pair equipment, such as concentrators and hubs, that was developed before the 802.3 10Base-T specification was finalized may not generate the link pulse that provides the basis for the link integrity lights on adapters and concentrators. For in-

## Taking it to extremes

By Judd Volino  
Special to Network World

When the *Network World*/Enterprise Technology Center, Inc. (ETC) test team set out to test 10Base-T adapters, the goal was to discover how 10Base-T, a relatively new technology, would perform in the working net of a typical organization.

The ETC staffers who were coordinating the test had heard stories about the susceptibility of Ethernet's 10M bit/sec signal to electrical interference when it is transmitted over unshielded twisted-pair wiring, as called for in 10Base-T.

Some users were also skeptical, citing rumors they'd heard about noise problems with pre-

*Volino is a consultant at Enterprise Technology Center, Inc., a multivendor systems integration showcase and testing facility based in Houston.*

viously installed unshielded twisted pair for Ethernet local-area networks. We wanted to find out what really happens when you use 10Base-T nets.

In designing this test, we discussed the perils of unshielded twisted pair in typical installations with Comtel Cable, Inc., a Houston-based cable company that installed the wiring for this test.

Comtel representatives related some of their practical experiences, which we adapted for our test environment.

The test found that the boards were not generally affected by the problem conditions that ETC and Comtel had created for the test. Boards were tested with wires subjected to many types of interference. Other problems were simulated, such as extended wire length and cabling that was below specifications.

One wire was passed over 20

110-volt fluorescent light fixtures. Another attempt to cause interference included operating a photocopier on top of a wire segment, and yet another had Comtel running a wire around an elevator shaft.

Nothing happened; the cards all performed the same in each attempt.

Electric motors in fans and a vacuum cleaner also proved unable to generate sufficient noise to interfere with normal network operations.

Other approaches to generating noise included using wire runs with a large amount of cable coiled up at one end, using multiple cross-connects through punchdown blocks and even using poorer quality cable than that specified in the 10Base-T standard.

Despite these harsh environments, the 10Base-T adapter cards performed without a hitch. ■



# User's

## **COS Presents The Open Systems Conference**

### **Sponsors:**

The User Alliance  
for Open Systems

The North  
American  
MAP/TOP Users  
Group

The North  
American ISDN  
User Forum

The Electrical  
Power Research  
Institute

### **Co-sponsors:**

Communications  
Week

The law firm of  
Bryan, Cave,  
McPheeters  
& McRoberts

Computerworld

Network World

Washington  
Technology

Phillips  
Publications

The OSI Network  
Management  
Forum

Bellcore

## ***An unprecedented show of cooperation by open systems user groups.***

**WHEN:** November 18 - 22, 1991

**WHERE:** Reston Hyatt - Washington, DC

**For \$395, participate in any three of the following programs:**

**Industry Power Panel** with: Donald Davis, President and CEO, Allen-Bradley; William J. Filip, IBM Vice President and President, Advanced Workstations; Larry Michels, President, CEO and Co-Founder, The Santa Cruz Operation; Lewis E. Platt, Executive Vice President, Hewlett Packard Company; Elton White, President, NCR Corporation; Roger Heinen, Vice President and General Manager, MacIntosh Architecture

**National ISDN 1 Planning Conference**

**User's Group meetings**

**A three day multi-vendor product Exhibit**

**Legal Issues in Open Systems**

**Communications Week's Open Network Excellence (O.N.E.) Award and Banquet with special guest speaker: Dr. Henry Kissinger**

**An informal evening of networking and live, professional entertainment.**

Call Cheryl Slobodian at 703.883.2765 or toll free in the U.S. at 1.800.759.COSI. Or, fill in the coupon and fax it to 703.883.2788.

Please send me more information  
about The User's Open Systems  
Conference.

Name \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_

Zip \_\_\_\_\_

Telephone \_\_\_\_\_

Fax \_\_\_\_\_



The Corporation for Open Systems International



## ALLIGATORS IN THE SWAMP

*Unforeseen problems that can  
put the bite on your network*

# When your net takes a holiday

Holiday power outage, other mishaps down a travel agency's T-1 circuits.

**O**n President's Day last year, an alligator struck our most critical network service from an unexpected quarter. It came from a part of the swamp we thought we'd already drained.

The company I worked for at the time, a leisure travel wholesaler, was critically dependent on digital voice services. Our reservations department, located in Culver City, Calif., was supported by two AT&T Megacom 800 T-1 circuits terminating in a D-4 channel bank that was connected to a Rolm Co. computerized branch exchange/automatic call distributor switch. The other departments used an MCI Communications Corp. T-1 circuit terminating in a second D-4 channel bank. The switch and channel banks, plus a number of cluster controllers, multiplexers and token-ring file servers supporting our data network, were powered by a 30K-watt uninterruptible power supply.

The director of data systems and I, the telecommunications manager, had come up with a written, tested procedure to follow whenever a power outage occurred. The uninterruptible power supply could sustain full load for 30 minutes. Therefore, we estimated that by running only essential equipment (the channel banks and switch) during an outage, we could make our power last for about four hours. We inspected the uninterruptible power supply daily and measured the voltage of each of its batteries, under load, once a month.

Then, on President's Day, a 10-minute power interruption occurred at 10:30 a.m. I wasn't concerned since our power outage procedure was in effect. My mood changed, however, when the help desk began to receive a flood of calls, the first of which was from the reservations department manager.

She was a woman of few words. "We're not getting any calls," she said, and hung up.

I quickly checked the equipment room. Everything appeared to be functioning normally — except for the channel banks, which were lit up with red and amber error lights. I discovered that although the channel banks had not gone down with the loss of power, all digital circuits were dead.

I called the help-desk numbers of both AT&T and MCI and reported that we had lost our T-1s. By 11:30 a.m., both had called back to say that the trouble tickets had been referred to our local carrier, Pacific Bell, for corrective action.

I deluged Pacific Bell with repeated and increasingly frantic calls for information and help. At about 7:30 p.m., a technician finally showed up. He said the trouble was in a fiber closet in our building.

I took him to the telecommunications room on the main floor of our building. It was locked, of course, and neither of us had a key. After spending another half an hour hunting for a security guard, we finally gained access to the room — only to discover the equipment was not located in our building. The technician then asked me if I knew where the fiber closet that supported our complex of buildings was. I suggested that he check with the security office located nearby. He went off to see what he could find out.

Finally, at 11:30 p.m., I began to get information from Pacific Bell. Apparently, the power outage had taken out a fiber-to-copper interface, the point on a fiber loop where the copper circuits for the building originated. I also learned that my three T-1 circuits — two from AT&T and one from MCI — were all carried on one fiber cable linking the building to Pacific Bell's central office.

Sometime after midnight, I received word that the fiber-to-copper equipment had been located, in a small utility room in one of the parking structures in our building complex. But a key to the room could not be obtained because the property management company was closed for the holiday.

*Murphy is a systems consultant with Paramount Pictures Corp. in Hollywood, Calif.*

At 2:00 a.m., my phone rang again.

"Good news," said the repair form. "Your T-1s are up and running."

"How'd you get a key?" I asked.

"Didn't get one," he said. "We used an 'unorthodox entry procedure.'"

I didn't ask any more questions, but I breathed a sigh of relief. Unfortunately, I breathed it too soon. The alligator wrestling was far from over.

The next morning, when the office staff began to arrive, I found out that they could neither make nor receive calls. Shortly thereafter, I received word that callers to our 800 number were getting a busy signal, something that had never occurred before.

After more frantic calls to the long-distance carriers' help desks, we determined that the night before, when the circuits were being restored, two of our T-1s had been interchanged. That is, the MCI T-1 circuit had been connected to the AT&T channel bank and vice versa. Apparently the midnight repair crew had thought there were two T-1s, rather than three, and had cross-connected two of them. Three hours later, the T-1s were properly connected and our problems were finally resolved.

### The postmortem

The following week, during a critique of the outage attended by my boss, my staff and representatives from both the local and long-distance carriers, we learned the following facts. Pacific Bell was in the process of installing a local fiber loop to support the area in which my company was located. Circuits for most of the companies in our part of town were to be carried by this fiber loop when the cutover was complete.

Because our fiber closet was housed in a temporary location in the parking structure, it had no backup power. Therefore, when the outage occurred, the fiber closet went down and did not recover. In addition, the temporary closet was not equipped with normal remote sensing capability, used by the local carrier to detect outages from the central office. Thus, Pacific Bell was unaware that critical equipment had failed.

What further complicated the problem was that the outage occurred on a holiday. Because the technicians who normally would have handled the job were off that day, the local carrier had to find on-call personnel to fill in. These technicians were unfamiliar with our part of town as well as with the location of the elusive fiber closet. To track it down, they had had to call a supervisor, who was also off for the holiday. All of this explained why it had taken so long to find exactly where our equipment was located.

This episode has a number of lessons for network managers. First, it's important to know what happens to your circuits once they leave your building. Find out exactly how your critical circuits are routed by your local and long-distance carriers. For example, I hadn't known the details of how our circuits were being managed during our local carrier's transition from copper to fiber, nor had I known that all my company's critical digital voice circuits were carried on the same fiber circuit.

Second, if network trouble occurs on a holiday, be aware that the on-call technician may not be familiar with the particulars of your setup.

Third, make sure you either have access to the keys to all rooms containing equipment essential to your network or know who does. The time spent hunting for keys cost my company a lot of potential revenue.

Remember: Even if your swamp is drained, other people's swamps are nearby. Don't let their alligators sneak in and put the bite on your network. ■

**IT'S HARD TO DRAIN THE SWAMP** when those reptiles keep getting in the way. To share your "alligator story," call Susan Collins, associate features editor, at (508) 820-7413 or fax your idea to (508) 820-3467.

By BEN MURPHY



## HIGH SPEED DATA TRANSFER

With Mitron's magnetic tape data communications terminals, you can transfer data off-line quickly and easily. Because Mitron terminals are completely independent of your mainframe, there's never a problem with incompatible software or disruptions to data transfer when the computer is down. Best of all, Mitron terminals are simple to install and operate. In 15 minutes you can be communicating with other Mitron terminals, bisynchronous terminals, or computers.

And Mitron terminals are real workhorses. They'll transfer data dependably day after day, for as long as you need them and at a price you can afford. Mitron's lease plans start as low as \$311 a month — with no upfront cost.

Did we mention that Mitron terminals are fast? The STD 1600 can transfer data at 256KB; the STD 6250 at 384KB.

If you are still mailing your tapes... stop. Let a Mitron terminal transfer your data faster and more reliably.

**Try a Mitron for 60 days.**

Our special no-strings offer makes it easy to put Mitron's claims to the test. Try one of our terminals for 60 days. If you're not completely satisfied, we'll terminate your lease.

To find out how you can simplify your company's data transfer, call 800 638-9965. In Maryland, call 301 992-7700, or fax to 301 596-5119.

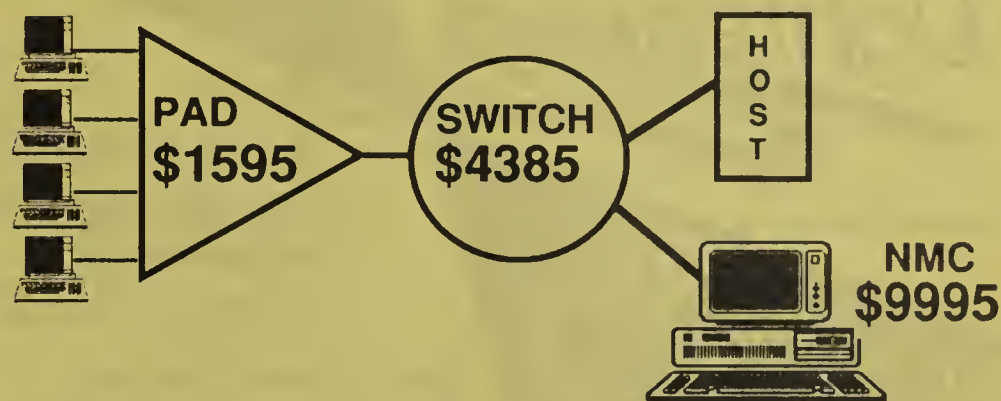
**MITRON**  
Systems Corporation  
2000 Century Plaza  
Columbia, MD 21044

**High-Speed  
Data Transfer.  
From Installation  
To Operation  
In 15 Minutes!**



## X.25 NETWORK CONNECTIVITY

### OST'S X.25 CONNECTION: SAVES \$\$\$



#### PAD FEATURES:

- Full support for CCITT (1984) X.25, X.3, X.28, X.29.
- Expandable up to 16 asynchronous ports, offering a per port cost of only \$193.
- No loss of configuration with loss of power.

#### SWITCH FEATURES:

- Multiple protocol support: 1984 CCITT X.25, X.32, X.3, X.28, X.29, SNA/SDLC, VIP & BSC with line speeds up to 64 kbps.
- Expandable up to 18 ports, offering a per port cost of only \$446.
- Battery backed-up line and routing configurations when loss of power is encountered.

#### NETWORK MANAGEMENT FEATURES:

- Graphic network display and statistics package.
- Management of configurations and software with support of up to 50 nodes.
- 386PC Inclusive.

#### SUPPORT:

- Free 1 year warranty service providing 24 hours a day, 7 days a week customer service.



For further information write or call:  
OST, Inc.  
14225 Sullyfield Circle  
Chantilly, VA 22021

Tel: (703) 817-0400  
FAX: (703) 817-0402  
Modem: (703) 817-0456, 2400 Bps;  
(703) 817-9846, 9600 Bps, 8A1(N)

Circle Reader Service No. 1

## 4 TO 64 PORT STAT MUX

# Multiplexer Breakthrough

"Our company was wasting \$44,000 a year without DATA RACE's 4-64 port Mux!"  
— MIS Manager

**Feature-packed  
64-Port Stat Mux in  
less than 1.5 cubic feet**



Circle Reader Service No. 3

Amazing NEW digital switching multiplexer from DATA RACE sets new price/performance standards.

Do remote users need to access your mini mainframe or LAN? You can save up to \$6,000 a year per user on operating costs with DATA RACE's new MACH DS 64 Multiplexer. Just 5 of 12 breakthrough features:

1. Lowest Per Port Cost in the Industry
2. Second Link Dial Standby
3. Multiple Analog AND Digital Link Support
4. No Compromise Tail Circuits
5. Nationwide On-site Service

**FREE** 12-pg. Network Applications and Product Catalog.

**Call 1 800 999-7223**

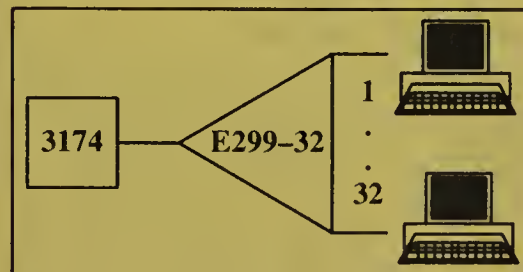
**DATA RACE**

11550 IH 10 West San Antonio, Texas 78230

## COAX MULTIPLEXER

### ELIMINATE COAX CLUTTER WITH THE NEW ASTROCOM E299-32 SQUEEZIPLXER

- Connect 32 category A devices to a 3174 cluster controller
- Cost Competitive alternative to the IBM<sup>™</sup> 3299 032
- LEDs highlight network activity
- Eight port E299 Squeeziplxer also available



Astrocom is the leader in providing products to minimize coax, fiber optic or twisted pair cable requirements in IBM 3270 environments. The E299-32 is the newest addition to the Astrocom Squeeziplxer family of coax multiplexers.

To learn more about how Astrocom Squeeziplxer products can help you to eliminate coax clutter call us toll free at:

**1-800-227-2959, Ext. 3000**

**ASTROCOM CORPORATION**

120 W. Plato Blvd. ST. Paul, MN 55107-2092

Circle Reader Service No. 2

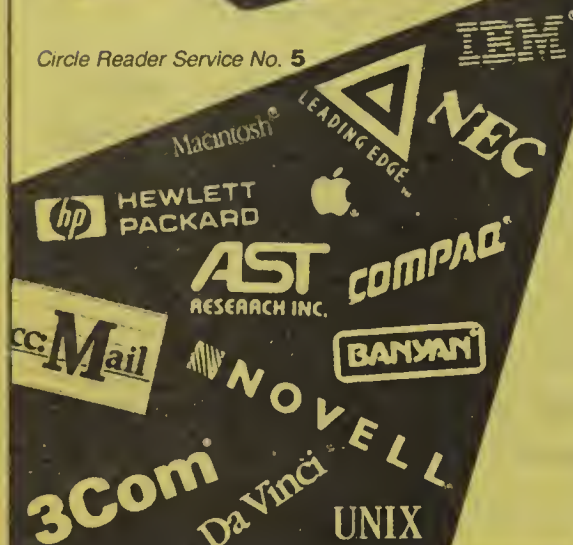


## COMMUNICATIONS SOFTWARE

**WANG**

# Lightspeed

Circle Reader Service No. 5



where  
Wang VS minis  
and the rest  
of the world  
intersect.

MacSoft's Lightspeed family of products integrates DOS PCs, Windows PCs, Unix terminals, Macintoshes, and LANs with Wang's VS line of minicomputers.

Features: Terminal emulation, printer sharing, file transfers with automatic document conversions, transparent mail exchange, and more.

Get maximum integration and top speeds.

Call us today. (805) 324-4291

**MacSoft**

1800 19th Street  
Bakersfield, CA

## DATA PATCHING

# AR DATA-PATCH® Patch/Switch AN EASY WAY TO ACCESS AND CONTROL YOUR NETWORK



AR DATA-PATCH digital and analog switching and patching systems offer a convenient, reliable, and inexpensive means of network control. From monitor/test access, to rerouting circuits, sparing equipment and restoring service.

Modular design lets you build a DATA-PATCH solution that precisely fits your network management needs. Interfaces supported include: RS-232/V.24, V.35, RS-449, T1, G.703, X.20, and X.21.

All DATA-PATCH units are built for long life, even in rigorous environments. Positive-latching plugs prevent accidental disconnects and magnetically latched relays assure circuit continuity in the event of power failure.

For more information, call or write today.

**1-800-368-3261**

**TELENEX**  
CORPORATION  
A UNIT OF GENERAL SIGNAL

**AR Test Systems**  
7401 Boston Boulevard  
Springfield, Virginia 22153  
Phone: 703-644-9190 • Fax: 703-644-2507  
Circle Reader Service No. 8

## COMPLETE LAN SERVICE

**BUY SELL  
OR REPAIR  
LAN HARDWARE**

**Complete LAN Service**

We are a  
component (chip)  
level repair depot that  
buys and sells used or  
new LAN Hardware.

**Hardware Specialties:**

3 Com • Corvus • IBM • Interlan • Novell •  
Proteon • Standard Micro Systems (SMC) •  
Western Digital • Pure Data • Gateway •  
Thomas Conrad • Tiara & Others

**LANFIX/LAN RECYCLERS**



**1-800 448-7420**

FAX: 1-800 752-6958

PHONE: 1-801-226-1832

1378 West Center St. • Orem, Utah 84057

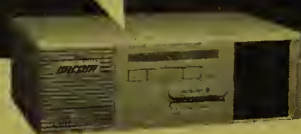
Circle Reader Service No. 6

## DATA/VOICE NETWORKING EQUIPMENT

# ONE TALKS. THE OTHER EMBEZZLES.

I can combine voice, data, fax and LAN  
over low-cost phone lines and save money.

drat!



Time was, the old stat mux was the best way to save money. Those days are gone. Your data-only multiplexor is costing you lost savings every day you use it.

For about the same price as a stat mux, you can now buy a data/voice network server able to combine remote voice, data, fax and LAN traffic over one low-cost leased line at speeds from 9.6K to 56/64 Kbps. It's called Marathon 1K and it's a breakthrough in technology and fast payback.

Using the same private line for voice and fax as well as data and LAN traffic can save big bucks month after

month on phone company toll charges. So Marathon 1K can pay for itself in just a few months, and after that all the savings go to your company's bottom line.

Products that don't save your company money are no more than profit robbers. Get Marathon instead.

Call for a free compressed voice demonstration or attend a Data/Voice Integration Workshop. Call toll-free (800) MICOM US (642-6687) or (805) 583-8600. Fax (805) 583-1997. Canada: (800) 932-DVNS.

Call MICOM today and stop wasting money.

**MICOM**

Circle Reader Service No. 9

## DATA COMM MATRIX SWITCH

### DISASTER PROTECTION

DESIGNED INTO THE MTRX TANDEM MATRIX SWITCH

THE STANDARD MTRX OFFERS 3-WAY PROTECTION AGAINST LOCALIZED DISASTERS SUCH AS FIRE, WATER, POWER, OR EQUIPMENT FAILURE

- 1 Separate MTRX Tandem Matrix Switch Assemblies in different parts of your building
- 2 Distribute MTRX Satellites up to 8 miles from each other
- 3 Connect MTRX Satellites to the MTRX Tandem Matrix Switch Assemblies over dual, diversely routed Twisted Pair or optical fiber cables

Plus take advantage of these other MTRX BENEFITS

- \*Largest Non-Blocked Port Capacity...8192 PORTS
- \*Up To 98% Data Cable Reduction DTE to DCE
- \*4000 FT DTE to DCE With Twisted Pair Cable
- \*8 miles DTE to DCE With Optical Fiber Cable
- \*LAN Based PC Control - Ethernet Or Token-Ring
- \*Multi-tasking (VM-386) Universal Workstation
- \*Integral BERG/BERT Test Functions
- \*Non-Proprietary Database, dBASE III PLUS/dBASE IV
- \*Supports Data Rates To 2.048MBPS

MTRX-500	512 Ports
MTRX-4000	4096 Ports
MTRX-8000	8192 Ports

Over 50,000 Ports Installed At RBOCs, Government, and Fortune 1000 Companies

Call us Today to Discover the *NEW DIMENSIONS* in Network Management Technology With the MTRX Family of TANDEM Electronic Matrix Switches



**Datacomm  
Management  
Sciences Inc**

"The Responsive Ones"

Circle Reader Service No. 7

25 Van Zant Street  
East Norwalk, CT 06855  
TEL: (203) 838-7183

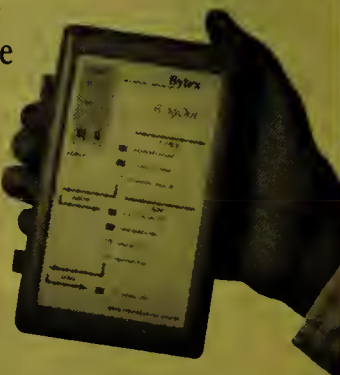
dBASE III PLUS/dBASE IV are trademarks of Ashton-Tate Corporation

## DIAGNOSTIC TEST EQUIPMENT

# Get your hands on the most comprehensive Token Ring cable tester for only \$1495.

Introducing the Bytex RingOut cable tester—the first designed specifically for Token Ring. And the easiest-to-use. ■ Tests 4 and 16 Mbps STP and UTP LANs. ■ Detects damaged or improperly installed cables or connectors. ■ Confirms correct operation of MSAU. ■ Detects and isolates beaconing nodes. ■ Works on live LANs—no shutdown required. Find out about our 30-day money back guarantee.

Call 1-800-23-BYTEX for details now.



**Bytex**

Bytex is a registered trademark of Bytex Corp.

Circle Reader Service No. 10



## DIAL-UP MANAGEMENT

### Optimize Dial-up Modem Network Utilization



#### With CDI's Patented Network Windows™ Management System

CDI's PC based Dial-up Modem Network Management System has been field proven worldwide since 1983. Reduce your line costs and prevent client loss with these features:

- Modem vendor independent-works with any modem type
- Provides local reconfiguration from the keyboard
- Generates complete daily usage and error reports
- Automatic busy of "ring no answer"
- Central site management of a distributed network
- UL approved

Circle Reader Service No. 11

**CDI - The Answer To Dial-Up Modem Management**  
Call or Write For Information & Demo Disk

Communication Devices Inc. • 1 Forstmann Ct. • Clifton, NJ 07011  
Phone 201/772-6997 • Fax 201/772-0747 • 800/359-8561

# CDI

## LAN

### Tired of LANs Giving You The Silent Treatment?

Get Them Communicating With

# HARRIS ADACOM

Complete Token-Ring Solutions!

- \* **Cabling Solutions:**  
MAUs, Media Filters, Repeaters
- \* **Bridges:**  
Local, Token-Ring, Ethernet  
Remote, Token-Ring, Ethernet, SNA, 56K, T1
- \* **Gateways:**  
Ethernet, SNA, TCP/IP, Token-Ring, Unix  
Local and Remote
- \* **FDDI**

For answers to your connectivity needs, call

**HARRIS ADACOM**

1-800-3270-ADA

Circle Reader Service No. 14

## ETHERNET NETWORK MONITORING SYSTEM



### The Network Professor®

- **Multi-Segment** Ethernet/IEEE 802.3 LAN Monitoring System.
- Global Network Monitoring and from **ANY** Location.
- Monitors **ALL** LAN traffic conditions on every segment, for all Stations/Nodes and Protocols, **simultaneously**.
- Alarming for user defined thresholds and detection of error conditions, resulting in **decreased downtime costs**.
- **X-Motif** or **ANSI** user interface provides access to current and historical network statistics via a Relational Database.
- Complies with **ISO Standards** for Enterprise Management.
- Industry proven since 1989. (**CALL NOW** for Fortune 500 references.)

"...only fully functional LAN Monitoring System..."

**Bill Hancock**

For Literature and your **FREE** Evaluation Package

**CALL (213) 379-2505**

Look for our **NEW 4 port Local Bridge!**

Circle Reader Service No. 12



## MULTILINE DSU/CSU'S

### TODAY YOUR APPLICATIONS DEMAND MUCH MORE FROM YOUR T1 DSU/CSU

Introducing the ConnectT1 Plus from **VERILINK**

**More Performance, More Flexibility, More Advantages** including:

- \* Access to T1, Fractional T1 and Virtual Private Networks
- \* Drop and Insert
- \* 2 Ports Expandable to 6
- \* Supports up to two T1 lines
- \* Continuous, Full Network T1 Performance Monitoring
- \* Network Management

Call Us Today Toll-Free at

**1-800-669-4278**

For Your **FREE** Verilink Planning Kit



The Helfrich Company  
19782 MacArthur Blvd, Suite 310  
Irvine, CA 92715



**VERILINK**

Circle Reader Service No. 15

## FAST REMOTE APPLTALK

### SyncRouter/LT • SyncRouter/LTi

**Synchronous routers connecting remote Appletalk networks via switched or dedicated digital phone lines**



Eliminate modem hassle. Because it uses digital lines that are six times faster than modems, the SyncRouter connects remote LANs in milliseconds, transmits with 99.75% accuracy, greatly reduces connect charges, and yields a 20Mb/hour throughput to efficiently handle any type, quantity or size file.

**SyncRouter:** The remote AppleTalk network solution for: corporate communications, resource sharing in education, fax replacement, multi-media file delivery, distance education and multi-user database access.



**Engage Communication, Inc.**

9053 Soquel Dr., #203 • Aptos, CA 95003 • 408-688-1021 • Fax: 408-688-1421 • AppleLINK: D3362

Circle Reader Service No. 13

## NETWORK MANAGEMENT

### AUTOMATIC

## NETWORK MONITOR & CONTROL

**\$ 795**

Remote System Diagnostic and Management with Eight or 16 Alarm and Control Points. Dataprobe's NEW Mini-MAC or SYMON-8. Send for Complete Details.



170 Coolidge Avenue / Englewood, NJ 07631  
Phone: (201) 569-6464 Fax: (201) 894-0939  
Circle Reader Service No.

Circle Reader Service No. 16



## PC BASED PROTOCOL ANALYZER

### A PC-based protocol analyzer that's serious about portability.



The LMI® is a PC-based protocol analyzer with a lot of get up and go. In a laptop, it weighs less than 15 pounds. You get maximum portability so you can zero in on problems in the shop or in the field. The remote option lets you monitor off-site lines, and captured data can be analyzed on any PC.

The LMI gives you in-depth plain English decodes, BERT/BLERT testing, time stamping, and interactive simulation.

We're serious about performance and portability. Call us at (708) 574-3399.



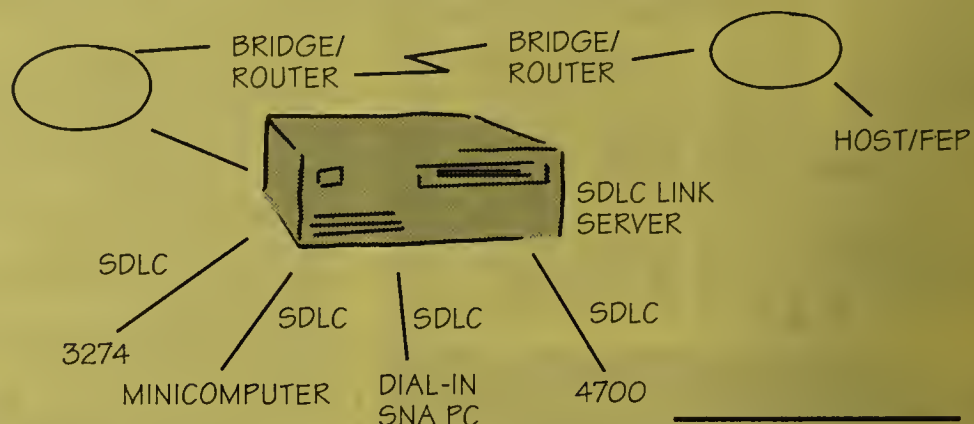
Progressive Computing, Inc.  
814 Commerce Drive, Suite 101  
Oak Brook, IL 60521 USA  
(708) 574-3399 FAX (708) 574-3703

LMI is a registered trademark of Progressive Computing, Inc.

Circle Reader Service No. 17

## SNA INTERNETWORKING

### Connect SNA/SDLC Devices To LAN/WAN Internetworks



With SDLC Link Server, transport SNA data across your internetwork. Eliminate parallel networks...Reduce costs...Improve response times...Support PU Type 2.0 and 2.1 devices...Leased or dial-up connections...With full NetView visibility!



Call  
**1-800-NETLINK**  
Today!

Circle Reader Service No. 20

## PC BASED PROTOCOL ANALYZER

### PC Based 9415 Protocol Analyzers

- Processor based for 256 kbps performance. **Available in full and 1/2 card lengths.**
- Statistical multitasking monitor with simultaneous data, decode, and statistics displays.
- SNA/X25/ASYNC/BISYNC decodes and statistics standard.
- User friendly 9400 interface.
- G.821 BERT standard.
- Compatible with all 9400 dedicated analyzers.



6611 Bay Circle, suite190, Norcross, GA 30071  
Call Toll free in the USA: 1-800-262-8835 Fax: (404) 446-2730

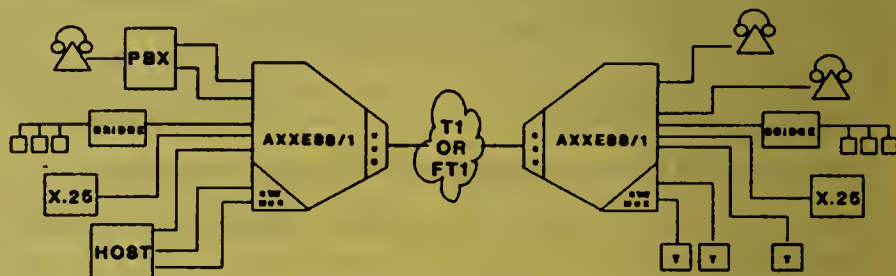
Circle Reader Service No. 18

## T-1/FRACTIONAL T-1 MULTIPLEXER

### T1/FRACTIONAL T1 TDM

#### FREE BANDWIDTH!

- 99% Efficient TDM
- Integral Statistical Multiplexer
- Quality Compressed Voice



Call 800-243-4485 or 203-265-7151 for details and local distributor



Over 7,000 Multiplexers Shipped  
50 Barnes Park North, Wallingford, CT 06492

Circle Reader Service No. 21

## PROTOCOL ANALYZER

### Introducing... A Powerful Protocol Analyzer in a PC



The AR INTERVIEW® 72 sets new standards in flexibility and value for protocol analyzers. Available pre-installed in a full-color or monochrome laptop or as a card kit that can be installed in just about any AT-compatible PC, the INTERVIEW 72 puts the power of an AR protocol analyzer into a PC.

Features include:

- X.25, SNA, BSC and Async
- Real-time data capture, trace, statistics, and emulation
- RS-232 and V.35 interfaces
- Automonitor
- Remote control capability

For more information, call or write today.

**1-800-368-3261**

Circle Reader Service No. 19



**AR Test Systems**  
7401 Boston Boulevard  
Springfield, Virginia 22153  
Phone: 703-644-9190 • Fax: 703-644-2507

## Send For Free Info

NW Oct 91

For more information on any of the products and services advertised in *NetworkWorld's ActionCenter*, circle the Reader Service Numbers on this coupon which correspond to the advertisement of interest to you.

Complete the coupon information and mail to:

**NetworkWorld**  
P.O. Box 5090, Pittsfield, MA 01203

**Expires 1/31/92**

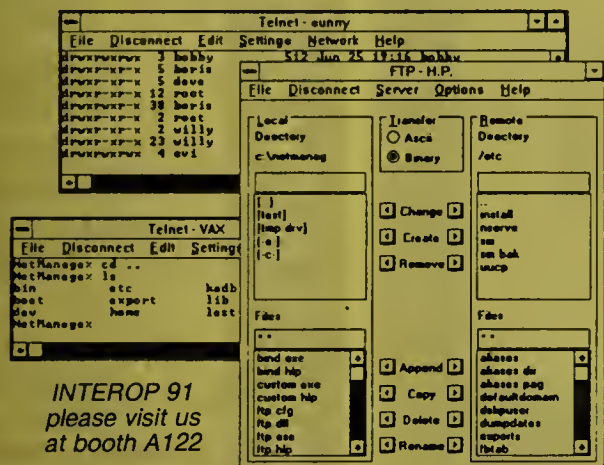
Name _____	1 2 3 4 5 6 7 8 9
Title _____	10 11 12 13 14 15 16 17
Company _____	18 19 20 21 22 23 24 25
Phone ( ) _____	26 27 28 29 30 31 32 33
Street _____	34 35 36 37 38 39 40 41
City _____	42 43 44 45 46 47 48 49
State _____ Zip _____	50 51 52 53 54 55 56 57



## TCP/IP NETWORKING

### TCP/IP for Windows 3.0

Chameleon is the first TCP/IP communications package developed specifically for Windows 3.0 (not converted from DOS), allowing multiple concurrent sessions with different accounts and hosts. Chameleon is the first TCP/IP applications package in the market implemented as a Windows Dynamic Link Library (DLL) and not a TSR, saving precious 640K base memory.



INTEROP 91  
please visit us  
at booth A122

#### Applications:

TELNET (VT100)  
FTP BIND  
TFTP Statistics  
SMTP Custom  
Mail PING

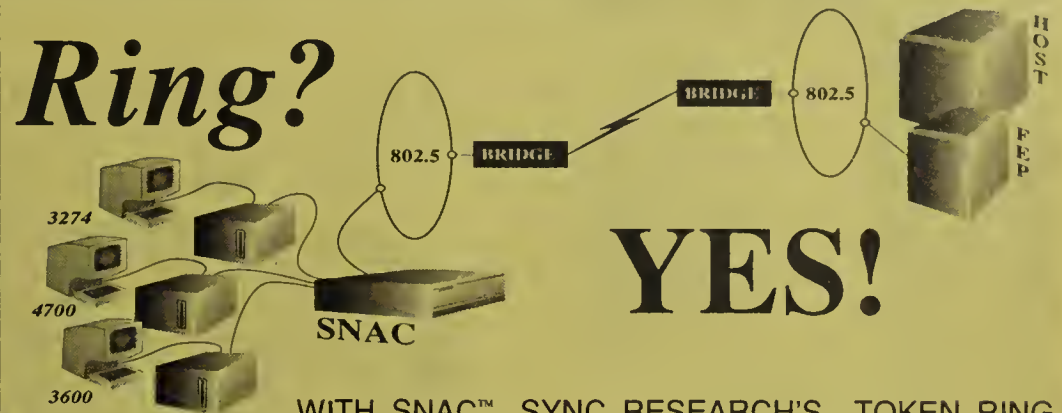
(408) 257-6404  
**NetManage**

NetManage Inc.  
10020 N. DeAnza Blvd.  
Cupertino, CA 95014, USA  
Fax: (408) 257 6405

Circle Reader Service No. 22

## TOKEN RING CONVERTER

### 3274's On a Token Ring?



# YES!

WITH SNAC™, SYNC RESEARCH'S TOKEN RING CONVERTER, YOU CAN CONNECT EXISTING "PRE-TOKEN RING" TERMINAL CONTROLLERS TO AN 802.5 TOKEN RING NETWORK.

- CONNECTS 3174s, 3274s, 4700s, 3600s AND OTHER PU2 CONTROLLERS TO TOKEN RINGS
- ELIMINATES MULTI-POINT SDLC LINES AND FRONT END PORTS

CALL 1-800-ASK SYNC  
for more information

**SYNC RESEARCH**

Circle Reader Service No. 24

## TEST EQUIPMENT

### A BREAKOUT BOX BUILT TO LAST—GUARANTEED!

- 100 red/green indicators
- Built-in pulse traps
- +/- output voltages
- Null-modem switches
- Lifetime warranty

PRICE: \$195<sup>00</sup>

Circle Reader Service No. 23



**Electrodata, Inc.**  
23020 Miles Road  
Bedford Heights, Ohio 44128-5400  
Call Toll-Free 1-800-441-6336  
(216) 663-3333 TWX: (810) 427-2280  
FAX: (216) 663-0507

## TYPE 3 MEDIA FILTER

### Flexible Filter.

This high-performance Type 3 UTP media filter is immediately available from Wise Components. Made by General Technology, it has a flexible 10-foot pigtail and is the most compact filter on the market.

Promising enhanced performance for your token ring network, filtration is achieved at 4/16 Mbps and lobe distance can be up to 328 feet (100 meters). The filter also provides equalization circuitry along with jitter and near-end cross-talk attenuation.

General Technology's media filter meets or exceeds FCC specifications and comes with either an RJ-11 or RJ-45 connector.

By calling Wise now you'll connect with more than flexibility. You'll get our superior service. Which includes fast delivery.



28 Henry Street  
Greenwich, Conn. 06830



800 543 4333 • In Conn. 800 852 8557 • Fax: 203 531 4859

Circle Reader Service No. 25

### Free product and service information is right at your fingertips!

Network World's ActionCenter makes it easy for you to get the free information you need on products and services that can make a difference to your organization.

- \* Use the Reader Service coupon in *Network World*.
- \* Circle the Reader Service numbers that correspond to the advertisements in ActionCenter.
- \* Fill out the coupon and send it to:

Network World  
P.O. Box 5090, Pittsfield, MA 01203

And the information you want will soon be on its way to you!

The sooner you return the coupon, the sooner you'll have the information you need to make informed purchase decisions.

## V.32bis + V.42bis + G3FAX-HIGH SPEED MODEMS

### Talk Fast - Talk for Less - Talk with ZyXEL

14.4Kbps - V.32bis+V.42bis+G3FAX, ZyXEL modems have it all:

ZyXEL U1496B - PC Plug In Internal Card.....\$449\*

ZyXEL U1496E - Stand-alone external model...\$469\*

ZyXEL U1496 - 20x2 LCD display, Menu Control  
2/4 wire leased lines, V.33/V.29/V.27ter.....\$650\*

\*Special introductory price. Valid until December 31, 1991.

### Low cost and high speed

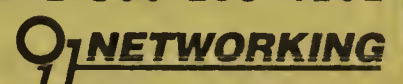
ZyXEL modems let you talk fast with wide compatibility

- DTE speed up to 57.6 Kbps with CCITT V.42bis and MNP® 5 data compression
- High speed compatibility with V.32bis and V.32 and low speed compatibility with V.22bis at 2.4Kbps and V.22/Bell 212A at 1.2Kbps
- Industry standard V.42/MNP4 error correction.
- G3 Fax send and receive capability with PC FAX software

5 yr. warranty parts/labor - 30 day guarantee - free tech support 1-800-255-4101

\*Prices and model specifications are subject to change without notice. MNP® is a trademark of Microcom Inc.

**ZERO ONE NetWorking** 4920 E. LaPalma Ave.  
Anaheim, CA 92807 • Tel: 714-693-0333 Fax: 714-693-0705

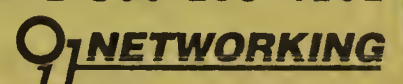


ZyXEL  
U-1496B  
PC Plug  
In Card

Dealer/VAR/Consultant Discounts  
See Us at Comdex Booth H 8000

ZyXEL U-1496

Call for Special Dealer Kit Savings  
Talk to us today!



Circle Reader Service No. 26



# NETWORKING MARKETPLACE

## CONSULTING

NOVELL SERVICE

SUPPORT & CONSULTING  
(408) 559-7367

*Networking Marketplace*

**150,000  
Buyers of  
Networking  
Products and  
Services are  
Within Your  
Reach!**

The Networking  
Marketplace  
section of  
**Network World**  
is your most  
cost-effective  
advertising  
vehicle.

**Network World**  
is the only  
networking  
newsweekly that  
reaches 150,000  
volume buyers  
every week.

Call: Joan Bayon  
Pinsky or  
Clare O'Brien  
**800-622-1108** or  
**508-875-6400**,  
today!

## READERSHIP LEADER

Unlike vertical technology  
publications, Network  
World has the only editorial  
format that covers all the  
technologies pertaining to  
the enterprise network.

That's why Network World  
is winning many of the in-  
dustry's most prestigious  
and independent reader-  
ship studies:

1991 Communications  
Networks - Exhibits Survey

1990 ICA/Wall Street  
Journal - Erdos & Morgan

1990 Networking  
Communications Market  
Survey - Research U.S.A.

1989 Communication  
Networks - Exhibits Survey

1989 ADCU Member

1988 ICA/Wall Street  
Journal - ERdos & Morgan

## The First Expandable 14-Port 10Base-T Ethernet Hub



Anco

10Base-T Solutions

1-800-545-ANCO

**SPEED  
LIMIT  
10  
MBPS**

## High Performance Connections For The LAN Highway

- User expandable to 14 UTP ports
- Compact (11½" × 1¾" × 4¼")
- Less than \$70 per port
- Available as PC half-card version

Pay only for the number of ports you need in your network. This low cost and space saving active 10Base-T Expandable Hub comes standard with six UTP ports. As your network grows you can add up to 14 ports with snap-in 10Base-T SIMM modules. If you still need more Ethernet ports, simply cascade these Expandable Hubs through their thinnet coax ports.

For more than 10 years Anco has been supplying high quality LAN products and cable solutions to OEM customers worldwide. Anco's high performance Ethernet, Token Ring connections offer you the best value in today's fast moving marketplace. For more information about Anco's Expandable Hub and innovative line of 10Base-T products, call today.

All brand and product names are trademarks or registered trademarks of their respective owners.

See us at Network Booth #3519

**Anco**

Anco Electronics, Incorporated  
9477 Archibald Avenue, Rancho Cucamonga, CA 91730

**1-800-545-ANCO**

1-800-545-ANCO • FAX (714) 989-9935

**INTERFACE CARDS • HUBS • REPEATERS • TRANSCEIVERS • CABLE PRODUCTS**

Circle Reader Service #115

## Plan Your Networking Marketplace Ad Schedule

Call Joan Bayon Pinsky 1-800-622-1108  
Pacific and Mountain time advertisers  
Call Clare O'Brien at above telephone

## REMINDER:

**The October 21st  
Issue**

**Closes October 9th**



## TRAINING

# TELEtutor

COMPUTER-BASED TRAINING

☐ LAN  
☐ X.25  
☐ T1

FOR FREE CATALOG  
OF ALL OUR COURSES  
CALL

1-800-542-2242  
(603) 433-2242

### Your Ad For Training Could Be Here For \$270.

Call Or Write:  
Network World,

Joan Bayon Pinsky,  
161 Worcester Road,  
Box 9172, Framingham,  
MA 01701-9172;

1-800-622-1108  
(in MA 508-875-6400)

Pacific and Mountain Time  
Contact Clare O'Brien  
at above address and  
telephone.

## UNIQUE EDITORIAL

Every week, Network World provides information that helps users who design, purchase and implement enterprise networks.

Network World's  
Weekly Coverage

- \* News
- \* Industry Updates
- \* Telecommunications
- \* Data Communications
- \* Local Networking
- \* Management Strategies
- \* Products and Services
- \* Buyer's Guides/Features
- \* International Networks

Enterprise networking is the driving force in today's end user market and the driving force of Network World's editorial.



## I'm holding a LAN Protocol Analyzer in the palm of my hand!

This miniature board, half the size of a standard PC card, slides easily into my laptop, converting it into a full-function LAN protocol analyzer.

It's my new LANVista 100, and CXR/Digilog designed it with both **portability** and **economy** in mind. Now I just pick up my laptop and take it wherever I want. It performs both **protocol** and **statistical analysis**, **7-layer decode**, and **cable testing**. I can even **generate traffic** from captured or generated frames, and stress-test my Ethernet network.

The LANVista 100 half-card protocol analyzer with its accompanying software costs only **\$1,995\*** - that's **less than half the price** of any comparable protocol analyzer on the market today. It's also available installed in a Toshiba 3200SXC Laptop.

Don't be fooled by claims about low end "software only" packages that merely provide statistics. Check out the **LANVista 100** and discover what portable and economical protocol analysis is all about.

**CXR/Digilog** also has a full line of WAN and LAN analyzers for both Ethernet and Token Ring Networks. Call 1-800 DIGILOG today.

\*US Currency

# CXR DIGILOG

900 Business Center Drive, Suite 200  
Horsham, PA 19044-3453 • FAX (215) 956-0108

LANVista is based on technology licensed by Digilog from Frontier Software Development Inc. of Tewksbury, MA

See Us at INTEROP Booth 1628 Circle Reader Service #131

### REMINDER:

**The October 28th Issue  
Closes October 16th**

### Special Comdex Fall Show Issue

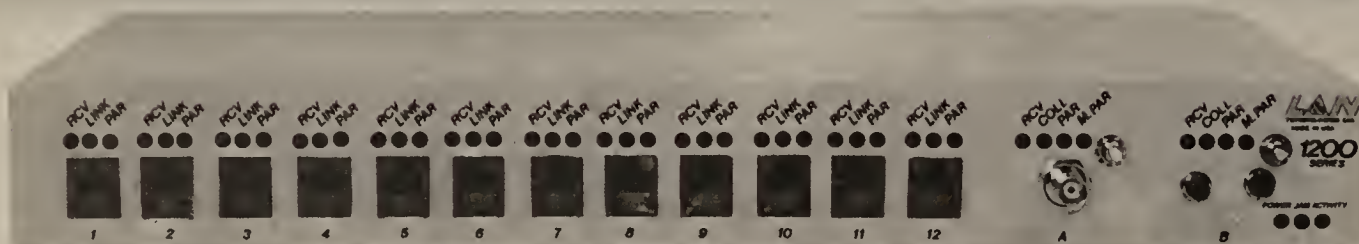
**October 21**

Closes: October 9th



# AFFORDABLE & RELIABLE

# 10 BASE-T TODAY!



**L & N** Technologies, Ltd. announces the Model 1200 Series, a fourteen port 10 BASE-T hub for unshielded-twisted-pair (UTP) ethernet networks. Features include:

- Twelve UTP RJ-45 Ports
- Universal Power Input
- Two Optional Ports for BNC, Fiber and/or AUI
- Automatic Partitioning for Network Failure Isolation
- LED's for Line Status, Receive Data & Collision
- Two Year Return to Factory Warranty

DISTRIBUTOR INQUIRIES WELCOME

Circle Reader Service #113



L & N also manufactures a complete line of Ethernet Repeaters

See Us At  
**NetWorld Dallas**  
Booth #4100-4102

**L & N**  
TECHNOLOGIES Ltd.

2899 Agoura Rd., Suite 196  
Westlake Village, CA 91361-3200  
Tel: (206) 290-1618 Fax (805) 494-3942  
European Sales Office (Tel): (0) 602491010  
United Kingdom (Fax): (0) 602491019

**Interested In  
Advertising In  
Network  
World's  
Networking  
Marketplace?**

**We Have  
Sections For:**

Telecommunications  
Equipment,  
Computers,  
Datacommunications  
Equipment,  
Seminars,  
Bids & Proposals,  
Consulting Services,  
Real Estate,  
Software,  
Training

Call Or Write:  
Network World,  
Joan Bayon Pinsky,  
161 Worcester Rd,  
Box 9172,  
Framingham,  
MA 01701-9172;  
800-622-1108

Pacific and Mountain  
time advertisers  
contact Clare O'Brien  
at above address  
and telephone.

**REMINDER:**

**The Nov.  
4th Issue**

**Closes  
Oct. 23rd**

## Your Key to Target Marketing



The Network World Subscriber List

Over 300 selection options...

- The key to better selectivity
- The key to prequalifying your list
- The key to a better return on your investment
- The key to a successful direct mail campaign

Call 800-343-6474, x202 for details

IDG Communications List Services

**NETWORK WORLD**



Network World's Direct Response Card  
Decks can be your trump card for generating  
quality leads and boosting your sales. When you  
advertise in our decks, your message reaches  
audited buyers, for just pennies a contact. And  
with your advertising message on one side and  
your company name and address on the other,  
we make it easy for our readers - your custom-  
ers - to respond to your message.  
For information on issue dates, closings and  
rates, call:

Joan Bayon Pinsky  
Sales Director/  
Product Classified Advertising  
1-800-622-1108  
(or in MA 508-875-6400)

Clare O'Brien  
Account Executive  
1-800-622-1108  
(or in MA 508-875-6400)  
(Mountain and Pacific  
time zone advertisers)

Your marketing success is in the cards —  
Network World's Direct Response Cards.

**Whether Your  
Product Is A  
Modem,  
Multiplexer,  
Balun Or Cable  
Advertise In  
Network  
Marketplace  
And Reach  
150,000 Buyers**



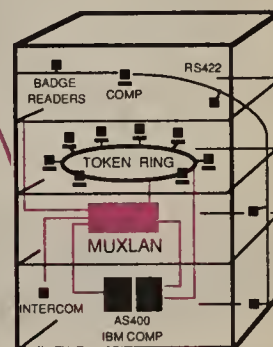
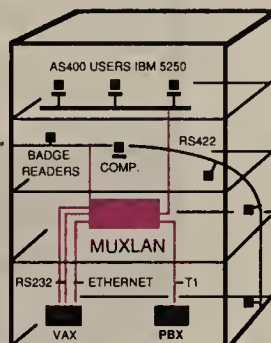
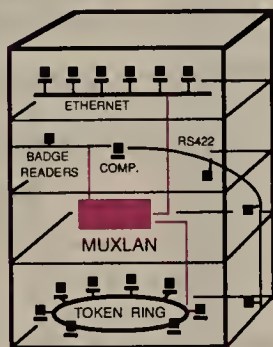
**SOFTWARE****PC BASED TELECOMM  
SYMBOL ICON LIBRARY****MARKETING, ENGINEERING, &  
CONSULTING PROFESSIONALS**750 TELECOMMUNICATIONS  
SYMBOLS AND ICONS AVAILABLE  
FOR VOICE, DATA & Networking.Use pre-drawn detail icons and  
symbols. Standardize your  
drawings & network diagrams.  
Create customized Engineering,  
Marketing presentations, and  
technical manuals Available in:  
• Vectorized AutoCAD formats.  
• Desktop Publishing & graphical  
formats (WMF, PCX, DXF & DWG)Order from: OSCG Inc. 1740 E. Gary  
Ave. Suite 109 Santa Ana CA. 92705  
Tel: (714) 476-2404 Fax: (714) 476-2405  
COMMA \$ 150.00**SAVE TIME****Your Ad  
For Software  
Could Be  
Here For  
\$360.**Call Or Write:  
Network World,Joan Bayon Pinsky,  
161 Worcester Road,  
Box 9172,  
Framingham,  
MA 01701-9172;1-800-622-1108  
(in MA 508-875-6400)Pacific and Mountain  
Time Contact  
Clare O'Brien at  
above address  
and telephone.**Network World  
was voted the  
'most useful'  
networking  
newsweekly by  
members of the  
prestigious  
International  
Communications  
Association  
(ICA) in the most  
recent  
Networking/  
Communications  
Market Survey  
conducted for  
Networking  
Management  
magazine by  
Research U.S.A.**

# HAVE YOU HEARD OPCOM, INC.'S SOB STORY?

## SONET OPTICAL BACKBONE!

OPCOM'S MUXLAN OC-1\*Level Sonet Optical Backbone operates on a dual counter rotating ring architecture, combining multiple protocols over a single pair of fiber optic cables. Now you can integrate voice, data and process control requirements while providing for seamless interconnectivity with a variety of current and emerging carrier services. Call now for more information.

SEE US AT 3016

**NETWORK WORLD 91** SMOCTOBER 15-17 • DALLAS  
DALLAS CONVENTION CENTER\*OC3 & OC12 VERSIONS AVAILABLE  
IN 1992.**• BENEFITS**UNLIMITED  
NODESUNLIMITED  
DISTANCES  
ON TOTAL  
RINGSTS-1 & OC-1  
INTERFACES**• PROTOCOLS  
SUPPORTED**

TI  
ETHERNET  
TOKEN RING  
IBM 5250  
RS232/422/485  
VOICE  
ANALOG  
AND MORE...

**OPCOM, INC.**1215 W. Crosby Road  
Carrollton, TX 75006  
Telephone: (214) 323-2310  
Fax: (214) 323-7061

Circle Reader Service #132

### Buy, Sell Or Announce Through Network World's Classified Section

Buying or selling communications-related products or services?

Or do you want to announce an upcoming event or business opportunity?

If so, Network World's classified section is the right choice for you.

You'll reach more than 150,000 communications/networking professionals all of whom are buying decision makers.

And you'll reach them every week.

Find out just how effective and cost efficient Network World classified advertising can be.

For all the facts write or call: Network World, Classified Advertising

Joan Bayon Pinsky, 161 Worcester Rd, PO Box 9172, Framingham, MA 01701-9172;  
800-622-1108 (in Mass., 508-875-6400)

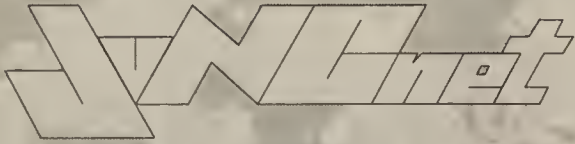
Pacific &amp; Mountain time zone advertisers contact Clare O'Brien at above address and telephone.



## DATA COMMUNICATIONS

## Global Connectivity at Your Fingertips

Gain Internet access through a connection to JvNCnet, and open your world to over 4 million people in 50 countries.



Join JvNCnet at one of many membership options, from dial-up access to 4.5Mbps dedicated line, and receive turn key installation, 24 hour support, monthly reports, network news and a lot more.

JvNCnet phone: 1-800-35TIGER e-mail: market@jvnc.net

Save 50% & More On All Products  
**BUY/SELL/NEW/USED**  
Reconditioned With Warranty  
Modems • Multiplexers • T-1 •  
CSU/DSU's • Channel Banks •

Codex 2640 Modem .....\$499  
T.P. 557 CSU/DSU 56KBPS ..... 195  
Infotron 790/990's .....60% Off  
Infotron T-1 Equip..... Call  
Datatel 9100 ..... Call  
Tellabs 440 and 445 .....50% Off  
Wellfleet Equipment..... Call  
Symplex Quantum Muxes..... Call  
Newbridge 3624 Mainstreet.....4995  
(New) V.32/V.42 bis Modems .....399  
All other models ..... Call

**METROCOM**  
(800) 364-8838

### Your Ad For Data Communications Could Be Here For \$180.

Call Or Write: Network World,

Joan Bayon Pinsky,  
161 Worcester Road, Box 9172,  
Framingham, MA 01701-9172;

1-800-622-1108  
(in MA 508-875-6400)

Pacific and Mountain Time  
Contact Clare O'Brien at  
above address and telephone.

## Buy or Rent Your Favorite

(MONTH TO MONTH)

PREVIOUSLY OWNED

NEW-USED-BUY-SELL-LEASE

**MICOM.** codex

paradyne AT&T

IBM Racal-Milgo

ARK CASE Datatel

Universal Data Systems General DataComm

NEW AND USED EQUIPMENT BACKED BY WARRANTY  
NATIONWIDE SERVICE MAINTENANCE AND INSTALLATION

### SOME SAMPLES:

ATT 2096A ..... \$1,695  
Codex 2660 (6 CH) ..... \$2,250  
IBM 5865-2 Modem ..... \$1,995  
Micom Box 2 (16 CH) ..... \$2,300  
Paradyne Pixnet XL ..... Call  
Timeplex Link 1 & 2 ..... Call

ALL GUARANTEED FOR  
MANUFACTURER SERVICE.

(201) 586-3070 FAX 586-3080

**Warwick**  
DATA SYSTEMS, INC.

66 FORD ROAD, DENVER, NEW JERSEY 07834

## INSTALLATION SERVICES

## Computer Cabling Design and Installation

Specializing in Local Area Network  
Wiring Topologies

Networks Include:

Token Ring • Ethernet • Fiber Optic • UTP

Authorized Installers For:

IBM's COS • MOD-TAP • STAR-TEK

Lifetime Service Warranty



Nationwide Services

**800 283-2821**

## -Computer Cabling-

LANs Installed

Outlets Relocated

- Professional hassel-free service •
- No additional charges for evening or weekend work •

(212) 807-5550

Fax(212) 644-6317

CALL OR FAX US WITH YOUR LOWEST QUOTE AND

**WE WILL BEAT IT**

## LANs

## Four reasons to buy Shiva's new 10BaseT Hublet

- 1 Shiva's new Hublet splits one 10BaseT ethernet line into four – without knocking a hole in your wall or wallet.
- 2 Hublet can also link 10BaseT workstations to form stand-alone workgroup mini-networks.
- 3 Hublet is fully IEEE 802.3 10BaseT compliant and works with any 10BaseT hub, network or card – including Shiva's EtherPort line of 10BaseT Ethernet cards.
- 4 Hublet cost just \$399. Call Shiva for the name of a dealer near you.

**Shiva Hublet™**

1-800-458-3550 1-617-252-6300

Shiva Corporation, One Cambridge Center, Cambridge, MA 02142-1601

For Information On Advertising  
In Networking Marketplace  
Call Joan Pinsky Or Clare O'Brien  
At 1-800-622-1108

## Upcoming Editorial & Show Coverage

October 14

1. Buyer's Guide: 10BaseT equipment; 2. Building an internetwork  
Show Distribution: NetWorld '91 Dallas; Special: Lead Service

October 21

1. Buyer's Guide: Superservers; 2. Evaluating LAN security  
Show Distribution: Comdex Fall

October 28

Wiring systems

November 4

Distributed processing/client/server computing  
Special: Lead Service

November 11

Buyer's Guide: ISDN service; Special: Harvey

November 18

Buyer's Guide: ISDN equipment

November 25

User Excellence Awards

December 2

Buyer's Guide: Integrated network management systems  
Show Distribution: Networking Open Sys. '91

December 9

DECnet update  
Show Distribution: Dexpo West; Special: Lead Service



# NETWORKING CAREERS



## SENIOR DATA COMMUNICATIONS ANALYST

As a recognized leader in the design, development and manufacture of world-class avionic systems, Smiths Industries maintains a non-stop commitment to leadership, quality and innovation. Join us now as a network communications analyst, and play a key part in planning and maintaining our voice, data and image communications.

Varied challenges will include problem resolution, performance measurement, tuning, configuration management, equipment inventory and capacity planning. You will also provide user training and utilize integrated network management controls to reduce equipment downtime, improve network availability and increase the productivity of network users.

Candidates must have a Bachelor's degree in Electrical Engineering, Computer Science or a related communications discipline. At least 5-8 years experience in Information Systems or Telecommunications, including a working knowledge of ethernet and X.55 communications, is essential. Experience in Decnet, TCP/IP, SNMP, IPXSPX and OSI is desired.

Smiths Industries offers a leader's compensation and benefits package. For consideration, please fax or mail your resume to: **Roosevelt Hampton, Manager, Human Resources Administration, SMITHS INDUSTRIES, Aerospace & Defense Systems Inc., Grand Rapids Division, 4141 Eastern Ave., S.E., Grand Rapids, MI 49518-8727. Fax: (616) 241-7533.** Equal Opportunity/Affirmative Action Employer. No agency referrals or phone calls please.

The Logical Choice



**SMITHS INDUSTRIES**  
Aerospace & Defense Systems Inc.  
GRAND RAPIDS DIVISION

4141 Eastern Avenue, S.E., Grand Rapids, MI 49518-8727

## LAN TEST SYSTEMS PRODUCT MANAGER

- Horsham, PA -

CXR/Digilog, a subsidiary of CXR Telcom, is an industry leader in the design and manufacture of LAN/WAN test equipment. We seek a qualified individual possessing a high degree of self motivation, excellent interpersonal skills, and the ability to handle multiple, high priority tasks.

This individual will report to the Vice President of Sales/Marketing and be responsible for life cycle program/product management, pricing and margins, business and marketing plans, and manufacturing build plan requirements. You will also be responsible for seminars, articles and promotional/sales support. Qualifications include a BA/BS in Engineering, Marketing, or 10 years' experience in a combination of technical/marketing positions; 3-5 years' engineering, field service or customer support of LANs or LAN products; and 2-4 years' marketing experience as a Product Manager/Product Specialist.

See us at Interop, Booth 1628, in San Jose on October 7-11.

For an exciting opportunity in this high growth market, send your resume to our corporate facility: CXR/Digilog, Human Resources, Dept. PM, 521 Charcot Ave., San Jose, CA 95131. No phone calls, please. Equal Opportunity Employer



## HARDWARE/SOFTWARE

# Your Field of Dreams

Imagine the perfect high technology world...challenging work in a creative and innovative environment and financial stability.

It's not a dream. It's Canon Information Systems. We're our own American venture recently funded to make a long-term contribution to developing new hardware and software computer and peripheral system products for North America.

All of these opportunities are for experienced engineers and require BS/MS-level background in CE/CS/EE or a related field:

### Manager, Controllers/Networks

- network-related product experience
- demonstrated technical leadership on complex system projects.

### Systems Engineer, Network Development

### Software Engineer, Network S/W

- development experience with Novell NetWare software and networking in Unix environment
- sys eng to design network s/w for Canon systems
- s/w eng to design product s/w for networking Canon systems

### Systems Engineer, Embedded Processing

- design experience with system products in CPU/memory, comm co-processor, graphic controller, and I/O subsystem areas

### Software Engineer, I/O Driver S/W

- OS/2 or Windows device driver implementation experience
- C and Assembler programming

We're a small team-focused family with plans to grow to no more than 100 team members by the end of this year.

And we reward our team members in the style of a progressive entrepreneurship, with such incentives as a performance-focused annual cash bonus, 3 weeks' vacation in the first year, and 5-week paid sabbaticals every fifth year.

For consideration, send your resume to: Professional Staffing, Canon Information Systems, Dept. NW, 3188 Pullman Street, Costa Mesa, CA 92626.

Equal Opportunity Employer M/F/H

# Canon

Canon  
Information  
Systems

A Research &  
Development Company

Today's Ideas...  
Tomorrow's  
Products...  
The Freedom To  
Create!

## Do you need to hire qualified Networking Professionals ? We can help...

For more information or to place your *Networking Careers* ad, call Bill Reinstein, National Sales Dir./*Networking Careers* toll free at 800-622-1108. (in MA 508-875-6400)

### Instructors

National Training Company seeks qualified instructors to teach **Fast Packet** related courses. Courses would be 2-3 days and concentrate on **Frame-relay**. Must have Real World experience, a training background and ability to travel.

Send Resume To:  
Network World  
Box B-5207  
Networking Careers  
161 Worcester Road  
Framingham, MA  
01701-9172





## An Environment Of Achievement. A Community For Families.

In San Antonio, Texas, you'll discover a rich multi-cultural lifestyle that combines urban amenities, easy commuting and one of the lowest living costs in the nation. It's a great place to raise a family, and we ought to know: USAA's corporate family is one of the biggest and best in San Antonio.

We are currently seeking:

### DB2 SYSTEMS PROGRAMMER

- Requires 2-3 years' DB2 systems programming experience
- DB2 problem determination skills and MVS debugging
- Experience in DB2 performance and tuning
- DB2 maintenance using SMPE
- Working knowledge of DB2 utilities, backup, recovery and attachments

### DB2 DATA BASE ADMINISTRATOR

- 5 years' experience with IBM mainframe applications and/or systems
- Previous experience in the physical implementation of a data model
- Proven use of the following tools: DB2, Explain, Lode

### IMS DATA BASE ADMINISTRATOR

- 3 years' experience with IBM mainframe IMS applications
- Previous experience in the physical implementation of
- Experience in performance and tuning of IMS data bases IMS data base models
- Knowledge of DBRC and backup/recovery of IMS data bases
- Knowledge of DB2 data base administration

### SYSTEMS PROGRAMMER- NETWORK MANAGEMENT

Minimum 5 years' experience in network management with mini-computers, such as DEC, Prime, HP. Additionally:

- Netview and SNA logical networking
- X.25 Network Management
- Network management in LANS utilizing ETHERNET and Token Ring
- TCP/IP and SNMP experience
- Working knowledge of OSI/CMIP
- Experience with DACS's, T3/T1 multiplexers, CSU's, DSU's and Transport Networks
- Working knowledge of PBX Management

### CICS SYSTEMS PROGRAMMER

- Requires 2-3 years' CICS systems programming
- Knowledge of MVS/ESA concepts
- Experience in performance and tuning preferable
- Exposure with IBM's Image Plus System

Qualified applicants should send a resume to:

**USAA**  
**USAA Building**  
**San Antonio, Texas 78288-0055**  
**Attn: Employment & Placement/TLL/SD/NW**  
**FAX: (512)498-1489**

No agencies, please. An Equal Opportunity Employer, M/F/H/V.

## Networking Careers On-Line

A new, free service for **Network World** readers interested in career opportunities.



If you're looking for more information on networking employment opportunities, consult **Networking Careers On-Line**, a part of the **Network World Bulletin Board System (BBS)**.

**Networking Careers On-Line** allows you to review an entire month's worth of **Networking Careers** employment opportunities as well as access valuable additional information about the advertising companies.

Log onto **Networking Careers On-Line** from any computer and modem by dialing 508-620-1160 [300-2400 Baud (8-N-1)], or 508-620-1178 [up to 9600 Baud (8-N-1)] today!

## NETWORK DESIGN ENGINEERS

The Northrop Information Services Center, one of the largest, most state-of-the-art information management centers in Southern California, now has excellent opportunities for experienced Network Design Engineers. Will perform complex analysis of technical requirements and specifications necessary for the planning, design, installation and maintenance of computer and network equipment. Will also act as project lead and coordinate the work of assigned personnel. Some travel involved.

Experience with the following equipment is preferred: IBM Mainframes and PCs, CAD/CAM, HP & DEC machines, Wang, Fibronics, WESCOM, Ethernet, Gateways, Fiber Optics and DS-3. Knowledge of T-1 & T-3, WANS, LANS, OSI, GOSIP, FDDI and test equipment, as well as experience in cable plant technology, video teleconferencing, factory automation and twisted pair also preferred.

For immediate consideration, please forward your resume to: Nancy Powell, NORTHROP INFORMATION SERVICES CENTER, Dept. 3605, P.O. Box 1138, Pico Rivera, CA 90660-9977. BOE M/F/H/V. U.S. Citizenship Required.

*Ready. Making Advanced Technology Work.*

**NORTHROP**  
Information Services Center

## When you need computer communications professionals skilled in network applications... ...Network World is right on target!



Network World can help you reach and recruit the most talented and experienced computer communications professionals. You see, every week over 450,000 total readers turn to Network World as their primary source of information on the fast changing world of networking. And unlike most other recruitment advertising media, we've taken the time to find out exactly what our readers are skilled in. So from LAN architectures to operating systems - network applications to transmission services...Network World and our readers are right on target.

Network Application	Network World Subscribers	Network World Total Audience *
Network management	97,265	213,983
Communications software	84,656	186,244
Electronic mail software	73,849	162,468
Network operating systems	71,598	157,515
Network security	63,943	140,674
Distributed D.B.M.S.	40,677	89,490
Call accounting	31,371	69,016
EDI software	17,862	39,296
Imaging application software	17,262	37,975

SOURCE: Network World, Audience Career-Skills Survey, 9/91  
 (1000 readers, "nth" name basis, 52.2% response rate)

\* Total audience including 2.2 pass-along readers per direct subscriber - Network World Editorial Study, 1/91.

For more information about placing your recruitment ad in Network World, call Bill Reinstein, National Sales Director/Networking Careers at (800) 622-1108 (in MA. 508-875-6400) today!



## MOVE BRIDGES

At RETIX, the world-wide leader in OSI networking and communications products, we're forging new boundaries for integrated open systems. WE ARE EXPANDING TERRITORIES in North America and are currently hiring major end-user Account Managers to sell Bridge/Router Products indirectly in Southern California, Chicago, Washington D.C. and New York areas. Degree plus 5 years sales experience in data communications/internetworking marketplace. Here is your opportunity to join in our success in a position that will challenge your creative sales abilities.

OTHER OPPORTUNITIES AVAILABLE: Sales Program Manager, Software and Hardware Engineers, Product Marketing Managers, Field Engineers, and Western Area Sales Manager (located in San Jose and responsible for OEM software sales in western states).

RETIX offers a strong, steady growth and opportunities, plus competitive compensation and benefits including a 401(k) plan. For confidential consideration, please mail or FAX your resume to: **RETIX, 2401 Colorado Ave., Santa Monica, CA 90404-3563. FAX (213)828-2255.** EOE M/F/H/V. Principals only please.

# Retix®

The OPENNetworking Company™

### NETWORK ENGINEER

RDC has an immediate senior-level position open in a state-of-the-art environment with extensive system integration requirements.

You must have strong "hands-on" technical skills and experience in the following areas: DOD, ISO, SNA protocols; multi-protocol bridges and routers; TCP/IP with VAX/IBM/RISC integration; FDDI; LAN Manager and 3COM 3+ OPEN. BS EE or related degree highly desirable.

### PROGRAMMER

RDC also has immediate requirement for mid-level programmer to maintain and enhance existing satellite communications related software and support development of replacement software. BS (MS preferred) EE or CS with min. of 3 yrs. exp. Working knowledge of satellite communications, device drivers, instrument control as well as FORTRAN and Assembly.

Send resume to Research & Data Systems Corp., Attn: Nancy Bean, NW-01, Suite 460, 7855 Walker Dr., Greenbelt, MD 20770 EOE

## Recruit the Best...At Comdex!

The October 21st issue of **Network World** will have over 12,000 bonus copies distributed at the Comdex/Fall trade show in Las Vegas, Nevada!

This year, Comdex will have an exclusive Network Computing showcase and conference sponsored by **Network World**. Over 100,000 attendees and 2,000 exhibitors will be on hand at Comdex - and **Network World** can help you reach and recruit these experienced computer professionals.

The space reservation closing for this special issue is Wednesday, October 9th - so don't wait! For more information about placing your ad, call Bill Reinstein at (800) 622-1108 (in MA. 508-875-6400) today!



**"W**hen a company reaches a billion dollars in sales, you can't count on it to run itself any more. You have to make some strategic decisions about what businesses to focus on. That's what we've done at AMD, and it's been a very satisfying process. I started as a member of the strategic development group four years ago because I was intrigued with the challenge AMD faced. We were a company in transition. The question was, as an industry leader, how to keep growing and remain profitable. The answers weren't always easy, but we know we made the right choices. We understand what it takes to succeed, we've set our direction, and we've put everything in place. And it's starting to pay off. You can see it in the way people look at AMD today. They're taking notice of us. And there's a feeling of respect. I'm proud to be part of AMD's new success. You can make your best shot here, too."

**When he's not golfing—or skiing, canoeing, camping, or fishing—Jim is involved as an AMD Fellow in strategic planning and analysis for AMD's Network Products Division.**

## The AMD Vision by Jim

### NETWORK PRODUCTS DIVISION

AMD is the leader in semiconductor LAN IC product solutions. We are defining the standards and setting the pace in this rapidly growing industry. Take on the challenge of furthering our edge in this marketplace as you enhance your skills set while working in the fastest growing segment of the electronics industry today: LAN Technology.

We are the industry leader in FDDI, including the development of low cost alternatives to fiber. AMD was the first into the marketplace with an integrated chipset for FDDI. Our customers have introduced more than 50 products incorporating our FDDI chipsets and they have over 150 more products in design. In the Ethernet arena, our Twisted Pair Hub, Transceiver and Controller products set the pace for High Integration, High Performance Mixed Signal IC Technology. For backend networks,

we have our point to point high speed serial TAXI products. Customer demand for our products has created new career positions for networking professionals. Consider the following:

**MARKETING**  
Product Marketing Manager

Product Marketing Engineer

**HIGH SPEED NETWORKS**  
Supervising Design Engineer  
Senior Design Engineer  
Senior CAD Engineer  
Supervising Test Engineer  
Systems Applications Engineer

**ETHERNET LAN**  
Senior Design Engineer  
Systems Development Engineer  
Senior Test Engineer  
Section Manager, Test Engineering

Please send your resume to Advanced Micro Devices, P.O. Box 3453, MS-935, Dept. 447, Sunnyvale, CA 94088-3453. Or FAX your resume to (408) 235-8636 Dept. 447. AMD is proud to be an equal opportunity employer.



### ASSISTANT DIRECTOR FOR DATA COMMUNICATIONS

The University of South Florida is a five-campus, instruction and research university and medical school on Florida's west coast. The University is undertaking a major project to upgrade data connectivity in support of its mission across a large geographic area.

Reporting to the Director of Telecommunications, the successful candidate will develop strategic and tactical plans for data communications involving diverse LAN's and SNA connectivity and develop and execute an operation plan for same. Successful candidate must be able to successfully work with personnel at all levels of the University organization.

Successful candidate must have Bachelor's degree in an appropriate area, minimum four years technical experience with Ethernet and Token Ring systems, and minimum three years management experience. Preference given to candidates with university management experience, SNA and TCP/IP experience, high-speed backbone experience, and demonstrated communications skills both written and oral.

Salary commensurate with experience and market factors.

Please submit cover letter, resume and salary history no later than 10/25/91 to:

George W. Ellis, Director  
Division of Telecommunications  
University of South Florida  
4202 East Fowler Ave. OPM-128  
Tampa, Florida 33620-7549

Position: #79854

NO TELEPHONE INQUIRIES, PLEASE!

THE UNIVERSITY OF SOUTH FLORIDA IS AN AFFIRMATIVE ACTION/EQUAL OPPORTUNITY EMPLOYER

## Your Ad Could Be Here For \$806.40

For more information or to place your recruitment ad in **Network World's Networking Careers**, call Bill Reinstein, National Sales Manager or Pam Valentinas, Eastern District Manager at 800-622-1108 (in MA, 508-875-6400) today!



**SR. TELECOMMUNICATIONS  
CONSULTANT****Global R&D Network**

Take on a newly created, expansion driven position in support of our international scientific R&D efforts. We're Marion Merrell Dow, a multi-billion dollar provider of prescription and over the counter pharmaceutical products with an enviable rate of growth and a record of stable expansion.

This position involves long-range tactical plan and policy development for our global scientific R&D telecommunications network and function. Leading an international, multi-disciplinary team, the selected candidate will oversee the network development and implementation, including voice and data architecture and design and migration planning.

Candidates will need 10-15 years of progressive successful telecommunications experience to include large scale project management and team development. Knowledge of hardware and software capability and capacity, and a Bachelor's or Master's Degree in computer science, math, or related field also required. Preferred candidates will have related global experience and/or a background in the pharmaceutical or scientific R&D fields.

Help improve the quality of life for others while improving the quality of your own life through our progressive work environment, excellent compensation, and the lifestyle advantages you'll find in Kansas City. For consideration, send resume to: Marion Merrell Dow, Recruiting & Placement, Dept. JKD, P.O. Box 9627, Kansas City, MO 64134. Equal Opportunity Employer. Principals only.



MARION MERRELL DOW INC.

For more information or to place your recruitment ad in Network World's Networking Careers, call Bill Reinstein, National Sales Manager or Pam Valentinas, District Manager at 1-800-622-1108 (in MA, 508-875-6400) today!

**Regional System  
Engineers/Consultants**

A worldwide 200m per year technology leader in the 3270 SNA marketplace is expanding its field organization to address the Fortune 500 companies requirements for communications processing. As a result, newly created, high visibility positions are being established. Current positions are available in New York City/New Jersey; Chicago/Detroit; Atlanta/Washington, DC; and Los Angeles/San Francisco areas.

Candidates should have 6-8 years experience in technical account management and pre-sales support roles. Knowledge of the SNA environment and experience in network processing is required. The candidate should have an in-depth understanding in midrange and mainframe network components and protocols including TCP/IP, SNA and LAN operating environments. System programming knowledge in NCP, VTAM, CICS and CMS is desirable. Educational background will require a BS in CS, EE, Physics or related discipline/experience.

If your qualifications meet these requirements and you want a challenging career with a technology communications leader, then send your resume along with salary history to: Networking Careers, Network World, Box B5206, 161 Worcester Road, Framingham, MA 01701-9172. EOE

**Need to hire qualified  
Networking  
Professionals ?**

**Network World** reaches over 150,000 networking and communications professionals every week! Your next employee could be one of them.

To place your ad or to receive a copy of our *Networking Careers* media kit, call Bill Reinstein, National Sales Director, *Networking Careers* toll free at 800-622-1108. (in MA 508-875-6400)

# Your Next Job May be On-line...

...On Network World's new  
*Networking Careers On-Line* that is !

**Networking Careers On-Line** gives networking and communications job seekers a new way to learn more about career opportunities advertised in **Network World**.

This new, free service, available through **Network World's On-Line Bulletin Board System**, was designed to provide you with the information you need to keep abreast of current opportunities and make informed career decisions.

**Here's what you'll see:**

- ▲ The full text of an entire month's worth of **Networking Careers** employment opportunities.
- ▲ Additional valuable information to educate you about company corporate backgrounds and current needs.
- ▲ The **Networking Career Forum** where **Network World** readers share information and advice about career opportunities and employment-related subjects.

**And, it's this easy to use:**

▲ **Networking Careers On-Line** can be accessed 24-hours a day on the **Network World Bulletin Board System (BBS)**. From any computer and modem, simply dial ;

■ 508-620-1160 [300-2400 Baud (8-N-1)]

■ 508-620-1178 [to 9600 Baud (8-N-1)]

**Networking Careers On-Line**



# I need a solution!

Please send me a free copy of  
"How To Integrate 3270 SNA, DEC  
and TCP/IP Networks."

Name \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_

Phone (    ) \_\_\_\_\_

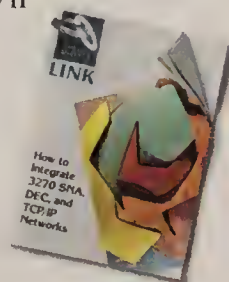
I ☐ recommend ☐ approve network purchases.

☐ I need to give the following users  
access to IBM mainframe resources.  
    \_\_\_ 3270    \_\_\_ DEC    \_\_\_ UNIX  
    \_\_\_ Macintosh    \_\_\_ PC

☐ I need to provide my 3270 users with  
access to a DEC VAX or TCP/IP  
host.

My needs are:  
    \_\_\_ immediate  
    \_\_\_ 6 to 12 months  
    \_\_\_ longer than 12 months.

☐ Please have a McDATA rep  
contact me.



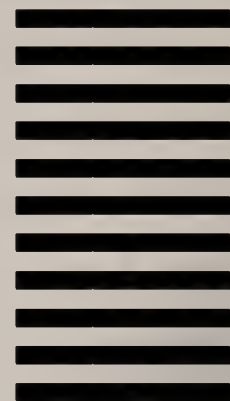
For immediate service, call  
1-800-545-5773, Ext. 50.

# McDATA





NO POSTAGE  
NECESSARY  
IF MAILED  
IN THE  
UNITED STATES



**BUSINESS REPLY MAIL**

FIRST CLASS PERMIT NO. 39 BROOMFIELD, CO

POSTAGE WILL BE PAID BY ADDRESSEE

Marketing Communications Department  
McDATA Corporation  
310 Interlocken Parkway  
Broomfield, Colorado 80021-9904





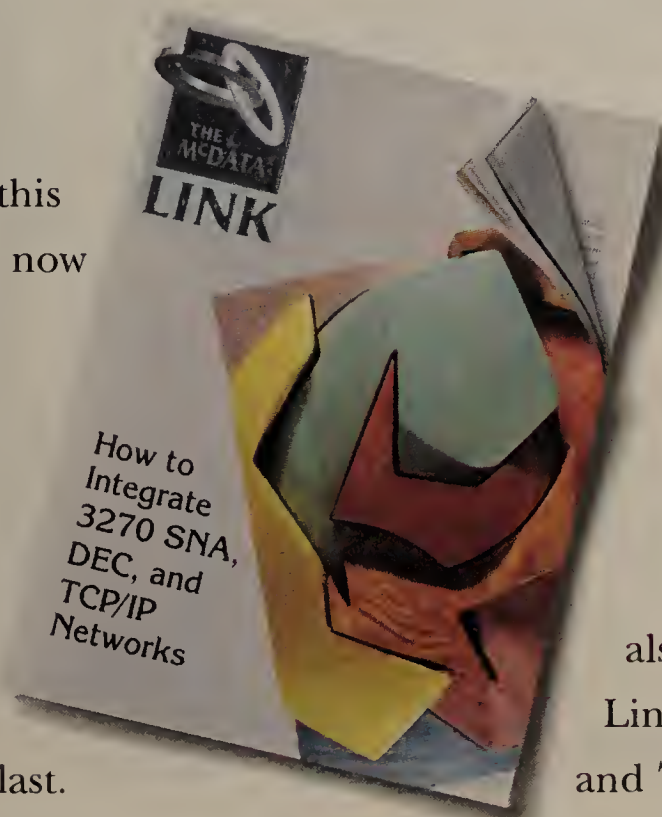
You've got IBM, DEC and UNIX hosts,  
Token-Ring and Ethernet networks,  
640 frustrated users, and one ticked-off boss.

What you need is  
one good solution.

Chances are, you've inherited this melange of computer systems. And now it's your job to make sense of it all.

We can help. "How To Integrate 3270 SNA, DEC, and TCP/IP Networks" is an objective white paper report on the number one issue facing network managers today. And it's yours free from McDATA while supplies last.

Case studies from major utility, health care, and manufacturing organizations demonstrate how to give DEC and UNIX users access to SNA applications. And give 3270 users access to DEC and TCP/IP hosts. Other examples show how to consolidate multiple, parallel links to mainframe resources. All the while satisfying management by maintaining current



investments in terminals, cabling and applications.

You'll read about specific real-world solutions for IBM, DEC and TCP/IP environments that are up and running — not theories.

Order your free copy today. We'll also send you details on the McDATA® LinkMaster® 6100 Network Gateway-Server and 7100 Network Controller products. We think you'll agree, they're the best solution for migrating users to the networks of the 90s. Return the reply card today, or call 800-545-5773, extension 50.

For your free report call 1-800-545-5773 ext. 50

See us at Interop Booth #503

McDATA Corporation 310 Interlocken Parkway Broomfield, Colorado 80021 (303) 460-9200 • McDATA, the McDATA logo, and LinkMaster are registered trademarks of the McDATA corporation. All other product names and identifications are trademarks of their respective manufacturers, who are not affiliated with McDATA corporation.

# McDATA





## At times like this, your investment in rerouting 800

Now you can be prepared for practically anything the future might hold. With AT&T Advanced 800 Service.

Whether it's a flash flood or your annual company picnic, if phones go unanswered you lose valuable 800 calls.

With our 800 Command Routing feature, you can preplan alternate routing to any other

location. So you know your 800 calls get through.

AT&T Advanced 800 Service offers a wide variety of ways for you to manage incoming calls more efficiently. You can route 800 calls to your different offices, based on geography, time of day and day of week. You can even preplan the percentage of incoming calls that each office receives for more effective use of your personnel.





800 calls looks wise indeed.

If 800 calls are important to your business, AT&T Advanced 800 Service is a very wise investment. Especially in case of a rainy day.

*Better service, better results.  
Another AT&T advantage.*

For more information, call your AT&T Account Executive or 1 800 247-1212, Ext. 431.



**AT&T**

The right choice.



## LAN Buyer's Guide

*continued from page 66*

time thereafter to alleviate the overhead the SNMP management will introduce, and the ability to load the agent into high memory or as a terminate-and-stay-resident program (to keep as much memory as possible available for

applications).

A larger issue than simply choosing the right 10Base-T adapter is the role of 10Base-T LANs during the next decade, given growing bandwidth requirements and the emergence of Fiber Distributed Data Interface running over shielded twisted-pair, and, eventually unshielded twisted-pair cable.

There are two camps where bandwidth requirements are concerned. One camp sees an explosion of LAN traffic requiring widespread use of FDDI to the desktop before we know it. The other camp looks at real-world traffic loads and the installed base of systems and applications and sees a long life ahead for 10Base-T. History suggests the

latter camp is correct.

Some imaging and multimedia applications can mean high-bandwidth usage or demand high throughput for real-time manipulation, but in today's environment, these are the exception to the rule.

Users must consider several elements in this equation:

- The data transfer rate of the cli-

ent's bus, the server's bus or both.

- Disk access speeds further limit possible maximum throughput in most instances.

- Low-cost multiport bridges — the big brother to today's hubs — will eliminate bandwidth sharing as a problem by providing a full, unshared 10M bit/sec to each port.

- Packet pipelining will enable workstations with standard 10Base-T adapters to transfer data onto an Ethernet segment at 8M to 9M bit/sec, provided their internal bus enables this. (With pipelining, a node that receives one packet assumes that all following packets are also addressed to it until otherwise discovered.)

- Compression technologies will enable transmission of much smaller files. (Implementation will require cooperation between vendors in choosing a standard method but will not require a change in the 10Base-T standard.)

- The vast majority of commercial applications put little stress on Ethernet.

So where does all this leave Ethernet? With plenty of headroom for 90% of LAN users for at least five years and for 70% of LAN users for the next 10 years. The star topology of 10Base-T LANs will enable users to add bridging, pipelining or both to their existing LANs simply by swapping out the hub or a card for a larger card cage-based hub.

In addition, three industry groups are working on a standard for running FDDI over shielded and unshielded twisted pair. A standard for FDDI over shielded twisted pair is close, and there is reason to believe that a standard for running FDDI over unshielded twisted pair will be available in a few years. This will enable a user to swap out the adapter without changing wiring, barring any distance limitations and poor wiring quality.

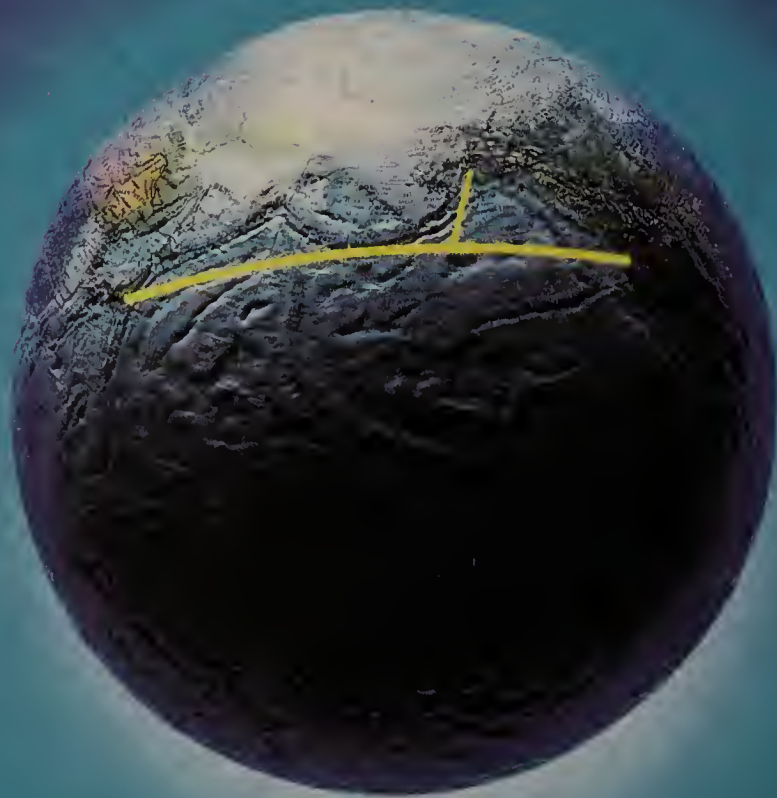
10Base-T LANs are becoming the default choice for many users, whether they have a large or small site. If you are not a Big Blue shop committed to token ring, 10Base-T products are the first place to look. If care is taken when testing the wiring during installation, you can't go wrong with a 10Base-T network.

10Base-T products are widely available and cost-effective, support all significant bus standards for personal computers, Macintoshes and workstations, offer comprehensive, standards-based network management and perform well for the great majority of application environments at the turn of the century.

No technology is completely troublefree, especially one such as 10Base-T, which must sometimes work on wiring that was installed before broadband LANs were popular. But for most users, 10Base-T is the right tool for the job now and in the future. ■

# JAPAN CALLING

Many calls originating in Japan now come to Europe via the North Pacific Cable (NPC). It's the largest-capacity cable in the Pacific, and the shortest direct communications link between Japan and the mainland U.S.



With a transmission capacity equal to 17,010 phone lines (1,260Mb/s), IDC's optical fiber NPC is a state-of-the-industry communications link between Japan and America.

The NPC is a joint project of IDC of Japan, Cable and Wireless plc (C&W) of the United Kingdom, and Pacific Telecom Cable Inc. of the U.S.

Spanning 8,380 km, the NPC is the world's longest direct cable. Its advanced optical fiber technology eliminates the noise and annoying time-lag that are often encountered when phoning overseas. It's also compatible with future communications, which will include data and image transmission.

What's more, with an optical fiber network in

the U.S. acting as a land bridge, the NPC is linked to the transatlantic cables. That means people who place calls to countries in Europe from Japan can expect the same high-quality service as to the U.S. and Canada. And later, when the Asian Pacific cable "APC" linking Japan, Taiwan, Hong Kong, Malaysia and Singapore is completed in 1993, IDC will connect even more of Asia to the world.

**IDC** International  
Digital  
Communications

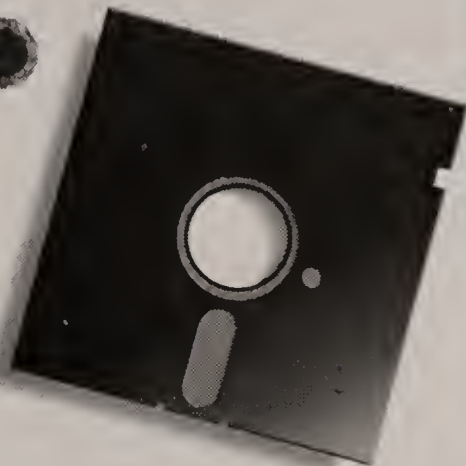
International Digital Communications Inc.

5-20 Asakusabashi, Taito-ku, Tokyo, Japan. Tel. 81-3-3861-0061 Fax. 81-3-3861-9961



# See network sharpshooting in action.

- ☐ Yes! I'd like to see how the new HP network advisor can turn network troubleshooting into sharpshooting. Please send me a FREE demo disk.



Phone \_\_\_\_\_

Name \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_ Mail Stop \_\_\_\_\_ Country \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

2163  
TMCTD104



**HEWLETT  
PACKARD**





NO POSTAGE  
NECESSARY IF  
MAILED IN THE  
UNITED STATES

**BUSINESS REPLY MAIL**

FIRST CLASS MAIL PERMIT NO. 609 CUPERTINO, CA

POSTAGE WILL BE PAID BY ADDRESSEE

**HEWLETT-PACKARD CO.**

Inquiry Manager

Customer Information Center

19310 Pruneridge Ave. M/S 49AM

Cupertino, CA 95014





## Firms to build hub, routing tool

*continued from page 2*

Cisco and SynOptics stressed that the RubSystem will not be available until early 1993. In the meantime, they will work with SunConnect to develop network management applications that allow current Cisco and SynOptics products to be managed from SunNet Manager.

According to Micheal Szabados, director of systems marketing at SynOptics, the RubSystem will be a next-generation hub with a Cisco routing bus woven in among Ethernet, token-ring and Fiber Distributed Data Interface buses.

Both companies will work to distribute

routing functions down to host modules — which provide the connection to LAN nodes — to enable them to decide whether incoming data from a LAN node should be passed to another node on the LAN or to a separate routing module.

Bruce Byrd, a product-line manager at Cisco, said his company will provide the routing modules for the RubSystem. Those devices will provide access to any of the RubSystem's buses, acting as a switch to pass traffic from an Ethernet, for instance, onto the high-speed routing bus for transmission across a wide-area circuit.

Although Byrd declined to disclose the speed of the routing bus, he said it would range somewhere between 533M bit/sec — the current speed of the AGS+ router

— and 2G bit/sec.

SynOptics now uses Cisco routing modules in its LattisNet System 3000 line of high-end hubs. SynOptics' LattisNet Manager network management system, which is based in part on the SunNet Manager, enables users to monitor the SynOptics and Cisco gear, although they must employ a command line interface rather than a graphical user interface, Szabados said.

Todd Dages, director of data communications research and consulting at The Yankee Group, a Boston consultancy, said the alliance will be a boon to the large installed base of users who have deployed SynOptics hubs and Cisco routers throughout their networks.

"Users will see this as a comfort zone to

know the leading hub vendor and the leading router vendor are making a joint effort to more fully integrate each other's products," he said.

Brian Plakis, network manager at MCI Communications Corp. in Richardson, Texas, said a "truly integrated router/hub will make our [internal] network faster and easier to operate.

"Our network is growing larger and more complex each day, so I'm encouraged to see vendors combine their separate components into a single device. The common management platform is another big plus that will save users a lot of headaches," Plakis said.

Details on pricing were not disclosed. **■**

## DOS version of APPC needs less memory

*continued from page 2*

"DOS is going to be around for a while. IBM needed something for that environment," said Atul Kapoor, vice-president of the consultancy Kaptronix, Inc. in Hawthorne, N.J. "The old product really stank. It wasn't a complete APPC; the user had to write system-type functions to extend it. Defining the environment and logging errors, there was no support for that or for collecting basic configuration information, like [physical unit] and [logical unit] names and addresses."

IBM is still trying to determine how many of those functions will be included in the new version, so memory requirements have not been established yet, said Steven Joyce, advisory programmer in IBM's new APPC Market Enablement group.

"There are two big things we wanted to do — get CPI-C [support] and come out with something that was significantly smaller [than APPC/PC]," he said.

Among the features still under consideration is support for the APPN end node. At a minimum, the software will let a DOS machine be configured as a Low Entry Networking (LEN) node, which Joyce said supports about 90% of the APPN end-node functions. LEN nodes and end nodes can communicate with other nodes in an APPN network but rely on APPN network nodes to supply routing data.

A limitation of LEN nodes is they must be manually configured at the net node.

The level of Windows support in the new product also has to be determined, Joyce said. Users will at least be able to employ APPC from a DOS box on a Windows screen, but a full-featured graphical user interface may come later.

"It's not clear where it'll end up. That's the type of feedback we expect from the beta test," he said. "Right now the most important thing for us to get out is the communications platform so that people have a good-sized DOS product."

Support for CPI-C promises to minimize the amount of education required to develop LU 6.2-based applications because the same application program interface can be used for all the SAA platforms. In addition, IBM is coming out with support for CPI-C under IMS, and the X/Open Company, Ltd. consortium has defined CPI-C as the interface to its Open Systems Interconnection transaction processing model, Joyce said.

Joyce could not estimate when the product will be formally announced or when it will ship but said the fact that it is in beta test indicates its debut shouldn't be too far off. **■**

## Now there's an expert system that turns network troubleshooting into sharpshooting.



Now, zero in on Ethernet or Token-Ring network problems, and hit the mark every time with HP's new network advisor. Just type in the symptoms, and let it go to work.

Its expert-system based Fault Finder software decides on the best action to take, automatically runs the tests you need, and tells you right where the problem is.

The network advisor also checks FCS errors, nodes, collisions, error frames and other network vital signs for baseline activity. A network and node statistics screen gives you a clear view of network performance. And if a problem's in sight, it decodes the major protocols to make sure you're on target.

So take better aim at network problem solving. Call 1-800-752-0900, and ask for Ext. 2163. We'll send you a free demo disk that shows how the HP network advisor turns troubleshooting into sharpshooting.

There is a better way.



**HEWLETT  
PACKARD**



## Oracle widens DBMS access

*continued from page 1*

applications in the next year or two.

"The software is not data base-specific," Wallace said. "It has been designed with general net communications in mind."

First introduced in 1986, SQL\*Net enables client data base applications to access Oracle servers when both devices are served by networks running the same protocol.

Although Oracle applications run identically over more than 80 hardware and software platforms as well as over 30 different protocols that SQL\*Net supports, the products did not allow cross-protocol communications.

In its exploration of ways to break this "protocol barrier," Wallace said, Oracle chose to avoid hardware protocol conversion because of the diverse heterogeneous environments its customers need to support.

A core component of SQL\*Net 2.0 is a component called the Transparent Network Substrate (TNS), which is used to establish and maintain connections between applications no matter where they reside.

If TNS determines a client request cannot be satisfied locally, the request is forwarded to a MultiProtocol Interchange, a network node outfitted with Oracle software. Multiprotocol Interchange nodes can be anything from a personal computer to a mainframe.

The Multiprotocol Interchange does not encapsulate

tiprotocol Interchanges to form what Oracle is calling an application network.

Although Oracle chose to provide this functionality through software, analysts said that users who have designed networks based on a few specific protocols and have opted to use gateways can already accomplish much of what Oracle is claiming to do with this release.

SQL\*Net 2.0 and the MultiProtocol Interchange will be available by the end of the year for MS-DOS, OS/2, IBM RISC System/6000 AIX, IBM MVS, IBM VM, DEC VAX/VMS, SunOS, HP/UX, Sequent DYNIX/ptx, Pyramid OSx and NCR 3000.

Protocols supported include the Transmission Control Protocol/Internet Protocol, Digital Equipment Corp. DECnet, Advanced Program-to-Program Communications (LU 6.2), Open Systems Interconnection, Novell, Inc. Internetwork Packet Exchange/Sequenced Packet Exchange, Named Pipes, IBM's Network Basic I/O System, Apple Computer, Inc. AppleTalk and Banyan Systems, Inc. VINES.

Additional platforms will be added next year. Oracle said pricing will vary, depending on configuration. ■

## DEC readies net mgmt. blitz

*continued from page 1*

Sources familiar with the announcements said DEC will unveil a low-end version of its Network Integration Server (NIS) 600, a multiprotocol routing platform announced in June ("New DEC, HP routers ready for ICA debut," *NW*, June 3).

The low-end NIS 500 will provide two slots instead of the seven available on the NIS 600 and, like the 600, will route DECnet, Transmission Control Protocol/Internet Protocol, OSI and X.25 packets, sources said.

The NIS 500 will support a single-port Ethernet interface, as well as an eight-port line card supporting speeds from 1.2K bit/sec to 64K bit/sec and a two-port line card with speeds ranging from 1.2K bit/sec to T-1/E-1 speeds, sources said.

The NIS 500, like the NIS 600, will support the OSI Intermediate System to Intermediate System routing protocol and the Spanning Tree Protocol for bridging.

DEC is expected to provide support for frame relay on the NIS 500 and 600 in January 1992.

DEC users wondered if the new routers make swapping out

existing equipment worthwhile.

"This is clearly DEC's attempt to catch up," said one large user in the Midwest who requested anonymity. "Will this product jump to the head of the market? And if it doesn't, why should we change our existing third-party routers? Frankly, we're quite happy with Cisco [Systems, Inc.]'s routers."

NIS 500 pricing is expected to start at \$14,000. The NIS 600 prices, by contrast, range as high as \$40,000. Both models are slated to ship in January 1992.

By January 1993, sources said, the NIS 500 and 600 will support Novell, Inc. Internetwork Packet Exchange (IPX), Apple Computer, Inc. AppleTalk, Xerox Corp.'s Xerox Network Systems and SNA protocols. They will also support Fiber Distributed Data Interface, High Speed Serial Interface and token-ring cards with source routing.

DEC will encapsulate SNA traffic in OSI IS-IS packets, sources said. It will announce a commitment to an IS-IS routing backbone, rather than the Routing Information Protocol, the current IP routing standard, or Open Shortest Path First, considered the next generation of IP routing.

DEC is also expected to disclose that its WANrouter 150 and

## A core component of SQL\*Net 2.0 is the Transparent Network Substrate.



packets or translate any protocols; it accepts application data in one protocol and then forwards it in another. All transport connections are within the natural boundaries of the underlying protocol. As a result, clients and servers running different network protocols can communicate as peers.

Any number of networks can be connected using multiple Mul-

# OUTPERFORMING

When it comes to attracting the computer industry's best exhibitors and educators, showcasing the newest products and services and addressing issues relevant to computer networking and connectivity, there's only one trade show that consistently outperforms all others. **NETWORLD.**

Designed as a global marketing and sales event, the 91 Dallas show will be **NETWORLD'S** best performance yet. Over 450 vendors will line the show floor, each able to answer your toughest questions, offer solutions and deliver all the latest technologies. And you can choose from a variety of topics featured in **NETWORLD'S** Conference Program—more than 70 Seminars and 12 full-day Tutorials all guaranteed to leave you charged with the latest industry information.



250 multiprotocol routers, announced last June, will be available in February 1992.

The WANrouter 150, priced at \$3,250, will support two lines at 19.2K or 56K bit/sec, and the WANrouter 250, at \$6,600, will support eight 19.2K bit/sec lines or two 64K bit/sec lines. Users of the DECnet Phase IV DECrouter 150 and 250 will be able to upgrade to the WANrouters for \$100, sources said.

On the network management front, DEC will unveil Version 1.1 of the DECMcc Management Station for Ultrix with such new features as an automated Management Information Base (MIB) compiler for translating and controlling third-party MIBs, compliance with the Internet Engineering Task Force's Simple Network Management Protocol (SNMP) MIB II definitions and support for management of DEC's LAN Bridge, DECbridge 90 and DEC-concentrator 500 for FDDI.

Version 1.1 will feature management of DEC terminal servers using DEC's proprietary Maintenance Operation Protocol, automatic configuration and mapping of DECnet Phase IV nodes, and a new scripting facility to automate repetitive tasks.

Version 1.1 of DECMcc Man-

agement Station for Ultrix is priced at \$7,070 and will be available this month. Like Version 1.0, Version 1.1 runs on a DECstation or VAXstation 3100 with 16M bytes of memory and 400M bytes of disk space.

DEC will also unveil the TCP/IP SNMP Access Module for the VMS-based DECMcc Director, an umbrella manager that controls, monitors and tests manageable network objects. The SNMP Access Module integrates MIB II variables and private MIBs into the DECMcc Director.

Previously, DECMcc Director had an SNMP access module that supported MIB I variables. The DECMcc TCP/IP SNMP Access Module is priced at \$6,200 and will be available this month.

Also, DEC is expected to disclose that its management products will conform to the OSF's DME as it becomes available.

Meanwhile, DEC will also unveil SNA gateways that can run under Ultrix. The vendor has been providing SNA gateways under VMS for many years.

DEC is expected to disclose that it will resell, under a previously announced agreement, 4M and 16M bit/sec Proteon, Inc. ProNET network interface cards, the Series 70 concentrator, the

TokenView+ network management system, the new Reduced Instruction Set Computer-based CNX 500 bridge/router as well as

the p4100+ bridge/router.

Lastly, DEC will take the wraps off Pathworks Version 4.1, which will support token-ring local-

area networks on DOS and OS/2 clients and servers, as well as TCP/IP, OS/2 LAN Manager 2.0 and DOS 5.0. ■

## DEC intros security software, services

MAYNARD, Mass. — Digital Equipment Corp. last week unveiled a raft of network security software that complies with the company's Polycenter systems management initiative. The vendor also announced new services to define and implement security parameters.

The software — which is designed to run on systems supporting DEC's proprietary VMS operating system — consists of DECinspect Version 2.1 and Security Reporting Facility Version 1.1 (DECsrfr) and SecurityGate Version 1.0.

The services include the Baseline Security Standard Service and the Baseline Security Management Service.

Used together, DECinspect and DECsrfr are said to establish a custom security and reporting system to manage access to a network of VMS systems.

SecurityGate is designed for

VAX hosts with routing capabilities that filter DECnet traffic according to origin and destination, time of day or week, DECnet object or task, and circuit used.

SecurityGate compiles access rules issued by the systems manager to define one or more "security domains" inside the host's routing domain. SecurityGate then restricts communications to or from those domains according to the rule set.

Observers questioned the relevance of SecurityGate.

"It doesn't make sense to have such a service targeted at VMS host systems," said Howard Niden, senior manager at Price Waterhouse, referring to the use of lower priced routers instead of host computers for directing network traffic. "It's not a product that works on the dedicated routers DEC has or that interoperates with Cisco [Systems,

Inc.], Wellfleet [Communications, Inc.] or Proteon [Inc.] routers."

The Baseline Security Standard Service is intended to help customers in setting up security parameters and evaluating VMS security according to those parameters.

The Baseline Security Management Service is designed to assist customers in devising an enterprisewide security standard.

DECinspect costs \$1,100 per VMS system, and DECsrfr is priced at \$10,000 per VMS system. SecurityGate costs \$7,500 for a "clusterwide" VAX 4000 license. The Baseline Security Standard Service software is priced at \$25,000, while the Baseline Security Management Service is priced at \$80,000.

All products and services are available now.

— Jim Duffy

# ALL OTHERS.

So plan to attend. And take advantage of this powerful opportunity to put your company in complete control of today's rapidly expanding computer market.

Call 800-444-3976 for information. Experience for yourself why NETWORLD is outperforming all others.

## NETWORLD 91 DALLAS

October 15-17, 1991  
Dallas Convention  
Center





## Internetwork tools shine at INTEROP

*continued from page 6*

software upgrade for its line of remote Ethernet bridges to support PPP as well as optional support for frame relay.

NAT will unveil a line of remote Ethernet products, including a remote bridge/hub, a remote IP router and an Ethernet traffic monitor.

The ILC/200 Remote Bridge Hub is a combination remote Ethernet bridge and 10Base-T hub that can be configured to support either 12 or 25 ports. It can be linked with another ILC/200 or with the company's LANB/200 Remote Bridge via any type of synchronous link.

The bridge adheres to IEEE 802.3 standards and supports all synchronous links, including T-1, fractional T-1 and E-1 links. It is available with RS-232, RS-449, RS-422, V.35 or X.21 link interfaces.

NAT also plans to unveil the LANB/280, an IP router designed to link remote LANs with a central network.

The LANB/280 supports a single Ethernet and is available with an RS-232, RS-449, RS-422, V.35 or X.21 interface, as

and is compatible with all current Fibermux hub modules.

FDDI support will be provided through a four-port FDDI-to-Ethernet bridging module that the company will preview at the INTEROP show. The bridge will provide transparent bridging from Ethernet to FDDI networks.

The Crossbow Plus chassis costs \$1,550 and will be available next month. The bridge module will begin shipping early next year. Pricing will be announced at the show.

For its part, Fremont, Calif.-based Alantec will announce its third-generation 10Base-T hub, which incorporates bridging and TCP/IP routing capabilities.

The PowerHub is based on multiple Re-

duced Instruction Set Computer (RISC) processors and provides 400M bit/sec of bandwidth. Using 45 million instructions per second of RISC CPU power, the PowerHub platform delivers 60K packet/sec bridging and 50K packet/sec TCP/IP routing on Ethernet.

The hub has 12 Ethernet and two FDDI ports. Each Ethernet supports as many as three 10Base-T workstation connections. Each FDDI supports one single- or dual-attached connection via a concentrator.

The platform, with 12 or 36 10Base-T workstation connections, is priced at \$14,880 and \$18,880, respectively. The FDDI add-in module will be available at year end and is priced between \$9,000 and \$11,000, depending on configuration. ■

## IBM net exec shares vision for products

*continued from page 1*

Users will feed traffic from computers, multiplexers and other devices into broadband backbone networks supported by the Paris switches.

"The reason we are doing this is we believe bandwidth will become cheaper over the years while an increase in traffic will be fueled by image, data and voice," he said.

### Paris impact

Commagrac said he expects the Paris switch to be commercially available in about two to three years. The device will likely compete with ATM switches expect-

**N**AT plans to unveil the LANB/280, an IP router designed to link remote LANs with a central network.

▲▲▲

well as a standard attachment unit interface connection.

The LANB/280 supports synchronous links to another router at speeds up to 2.048M bit/sec. It supports PPP and can interoperate with other IP networking devices that support PPP, such as Cisco Systems, Inc. routers.

Both the ILC/200 and LANB/280 can be managed through the company's NMS/100 network management system or SNMP-based network management systems from other vendors.

Available this month, a 12-port version of the ILC/200 costs \$3,695 and a 25-port version is \$4,895. The LANB/280 costs \$2,995 and is available now.

NAT also plans to introduce the LANB/250 Remote EtherMeter, an Ethernet traffic monitor for remote LAN segments. The LANB/250 is a stand-alone unit with one serial port for an asynchronous modem connection and one Ethernet port. A network manager can dial into the LANB/250 via a modem to monitor traffic on a remote LAN segment as well as access LANB/250 statistics.

Priced at \$1,795, the LANB/250 is expected to be available in December.

### Fibermux offerings

Fibermux of Chatsworth, Calif., will introduce its first products aimed at helping users support 100M bit/sec FDDI LANs.

The company will unveil Crossbow Plus, its next-generation hub that supports FDDI as well as token-ring, Ethernet, AppleTalk and Apollo Division of Hewlett-Packard Co. Domain LANs.

The 14-slot hub connects as many as 140 Ethernet or token-ring workstations. It has four load-sharing power supplies

1975 Launched the first U.S. public data network. 1979 Built the first commercial private packet network. 1980 Introduced the first major public packet network.

**MADE FOR EVE, WILLIAM, ISAAC, AND STEVEN.**



1988 Sprint completes the only nationwide 100% digital fiber optic network. Sprint awarded 40% of FTS 2000 contract. 1989 World's first and largest privately-owned fiber optic network.



ed from multiplexer vendors, including Network Equipment Technologies, Inc. (NET).

IBM is still evaluating what impact the Paris switch will have on its relationship with NET, Commagnac said. IBM currently resells NET multiplexers.

He added, however, that IBM is committed to protecting users' existing investments. This means the Paris switch will be able to operate with users' existing NET multiplexers, for example.

Commagnac said he recently moved Paris development from IBM's network laboratory in Raleigh, N.C., to La Gaude in an effort to exploit the synergies between the switch and IBM's 3745 front-end processor, which is also developed here.

Commagnac assumed responsibility for the La Gaude and Raleigh laboratories in June. Both facilities develop nearly all of IBM's network hardware.

Under his direction, IBM will move development of all high-end network hardware to La Gaude and dedicated relegate the Raleigh lab to focusing on low-end, high-volume products such as cluster controllers and token-ring adapters.

#### Other developments

Commagnac also announced plans to move Fiber Distributed Data Interface development from Raleigh to La Gaude. Commagnac said he wants both labs to unite on a common architecture for hardware products.

He said IBM is developing a switch for a handful of users in Europe to connect customer premises equipment to Integrated Services Digital Network Primary Rate Interface (PRI) services.

Commagnac said the PRI switch will be able to link Token-Ring Network LANs, 3745 front-end processors and other devices to PRI services. The PRI switch will be smart enough to dynamically allocate one or more 64K bit/sec ISDN bearer channels to devices. It will also multiplex traffic from multiple devices onto a single 64K bit/sec PRI channel.

Commagnac said IBM will probably deliver the PRI switch in about two years. IBM has not decided if it will make the product generally available in all countries.

Additionally, Commagnac disclosed that IBM is considering entering the wireless LAN market. The vendor is considering integrating support for wireless LANs into the 3745 front-end processor, Personal System/2 components — such as token-ring cards — and other equipment.

Commagnac said IBM is also studying ways to integrate wireless LAN technology with cellular mobile radio technology. This would enable users to use wireless technology to support both LAN and wide-area network links. "We believe there will be a booming market for this," he said.

Commagnac declined to further detail IBM's plans, except to say it is considering teaming up with another vendor to enter the wireless market.

#### APPN due on 3745

On another front, Commagnac disclosed details about IBM's plans to add Advanced Peer-to-Peer Networking (APPN) support to the 3745. IBM plans to introduce the support in about two years. This will enable a 3745 to be a full network node in a Systems Network Architecture network.

That means 3745s will be able to communicate as peers with one another and dynamically route traffic between one another.

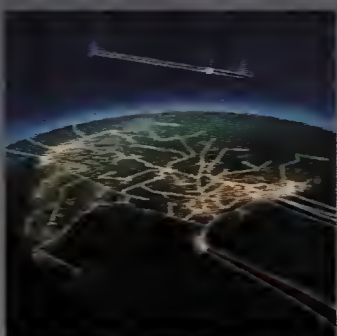
Currently, 3745s can only be configured as end nodes without dynamic routing capabilities. They can now also be positioned as the hub of a hierarchical SNA subarea network or a gateway between two different SNA subarea nets.

As IBM moves toward support of broadband networks running at 140M bit/sec and faster, Commagnac said the vendor will increasingly embrace peer-to-peer communications. He said IBM will have to enable user end nodes to communicate more easily as peers in order to efficiently support broadband networks. ■

## MADE FOR LANs, MANs, AND WANs.

These days, companies are finding whole new ways to communicate. LANs are turning into MANs and WANs. Both of which are being linked to minis and mainframes.

And because of our network design, we have a better way to tie it all together. In fact, we have a solution for every major computing environment, topology, and network operating system. With everything from private lines to the newest technology.



Including switched 56 and frame relay internetworks.

If you'd like to know more, call 1-800-659-3731. We'll have detailed information in your fax machine in minutes. And we'll show you the right way to send

data. On a network that's the perfect medium for everyone from Adam and Eve to Steve Wozniak.

 **Sprint.**  
Made for data.™

#### NETWORK WORLD

161 Worcester Road  
Frammingham, Mass. 01701-9172  
(508) 875-6400

Second-class postage paid at Frammingham, Mass., and additional mailing offices. *Network World* (USPS 735-730) is published weekly, except for a single combined issue for the last week in December and the first week in January, by Network World, Inc., 161 Worcester Road, Frammingham, Mass. 01701-9172.

To apply for a free subscription, complete and sign the qualification card in this issue or write *Network World* at the address below. No subscriptions accepted without complete identification of subscriber's name, job function, company or organization. Based on information supplied, the publisher reserves the right to reject non-qualified requests. Subscriptions: 1-508-875-7444.

Non-qualified subscribers: \$5.00 a copy; U.S. — \$95 a year; Canada, Central & South America — \$110 a year; Europe — \$165 a year; all other countries — \$245 a year (air-mail service). Four weeks notice is required for change of address. Allow six weeks for new subscription service to begin. Please include mailing label appearing on front cover of the publication.

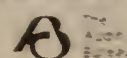
*Network World* can be purchased on 35mm microfilm through University Microfilms Inc., Periodical Entry Dept., 300 Zeeb Road, Ann Arbor, Mich. 48106.

*Network World* is distributed free of charge in the U.S. and Canada only to qualified management or professionals who specify and maintain communications equipment and systems, including voice, data and video, as well as to common carriers, consultants, systems houses and manufacturers of communications equipment.

**PHOTOCOPY RIGHTS.** Permission to photocopy for internal or personal use or the internal or personal use of specific clients is granted by Network World, Inc. for libraries and other users registered with the Copyright Clearance Center (CCC), provided that the base fee of \$3.00 per copy of the article, plus 50 cents per page is paid directly to Copyright Clearance Center, 27 Congress Street, Salem, Mass. 01970.

**POSTMASTER:** Send Change of Address to *Network World*, 161 Worcester Road, Frammingham, Mass. 01701-9172.

Copyright 1991 by Network World, Inc. All rights reserved. Reproduction of material appearing in *Network World* is forbidden without written permission.



Reprints (minimum 500 copies) and permission to reprint may be purchased from Donna Kirkey, Network World, Inc., 161 Worcester Road, Frammingham, Mass. 01701-9172.



## Lawmakers call for quality

*continued from page 2*

Chief Richard Firestone echoed the opinion of FCC Chairman Alfred Sikes when he told Congress the outages are anomalies and do not indicate a general deterioration of the network.

Firestone said the agency has made a number of moves to ensure network performance in recent years, ranging from automated carrier reports to net monitoring requirements imposed along with price cap regulation. He also said the FCC late last month issued proposed rules outlining how and when carriers must report outages.

Firestone flatly rejected the idea of the FCC setting network standards. "I don't feel that having the government set standards at this time is best," he told lawmakers on the House Subcommittee on Government Information, Justice and Agriculture. "Standards tend to settle to the lowest common denominator."

Several lawmakers, however, made it clear that they were not satisfied with the FCC's actions up to now and would seek some changes in the agency's enforcement and oversight procedures.

"The FCC's oversight [of the public network] is deficient," said Rep. James Scheuer (D-N.Y.). "Lax regulation and lax oversight by the FCC may have prompted AT&T to sacrifice quality for lower costs and higher profits. It's not enough for the FCC to practice damage control."

Rep. Bob Wise (D-W.Va.) last week echoed those sentiments at a hearing he held. Wise said he was disturbed by "the inclination of the commission to distance itself from the reliability issue. My concern is that the FCC is playing catch-up [in dealing with outages]."

AT&T's Sept. 17 outage knocked out communications for air traffic controllers at the three major airports serving New York and set off a chain reaction that eventually caused the cancellation of 658 flights and the delay of 635 others, according to a Federal Aviation Administration official.

A series of outages caused by a software glitch in signaling software in Bell Atlantic Corp.'s and Pacific Bell's nets this summer left millions of customers without local service for several hours. AT&T also had a major outage in January 1990 caused by a software glitch.

Last week, Wise introduced H.R. 3444, which would require the FCC to implement and enforce network reliability standards. The bill would mandate the FCC to develop a scale for measuring the impact of outages based on such factors as the length of the outage, the number of customers affected and the level of redundant facilities.

The bill would also require carriers to report outages to the FCC in a timely fashion and establish procedures for them to share data about past outages.

Even if Wise's bill is modified, it seems likely the FCC will be in-

involved to some degree in setting network standards.

Eli Noam, a former commissioner with the New York Public Service Commission and currently a professor at Columbia University in New York, said the FCC must play an active role to ensure that carriers have the incentive to keep net quality high, rather than cutting back on expenses such as maintenance to boost profits.

"I'm not suggesting price caps be dropped, but [rather] the price cap formula should be modified to include an element of service quality," Noam said.

Linda Garcia, project director of telecommunications and computing technologies in the U.S. Office of Technology Assessment, also predicted continuing problems with the network unless oversight is beefed up. She suggested that the FCC step in and establish broad network performance objectives and leave it to voluntary industry groups to do the nuts-and-bolts implementation of those mandates.

The FCC works with the Exchange Carriers Standards Association (ECSA) on standards development and is likely to rely on such voluntary standards groups even more heavily now.

"There is a clear expectation at the FCC that the Network Operations Forum (a work group within the ECSA) will continue to be active in information sharing and reliability issues," said Rick Harrison, moderator for the forum. "If we in the industry do not [establish network standards], the government will do it for us." ■

## Sun adds new line of servers

*continued from page 4*

module into the servers' 64M-bit MBus. Each SPARCmodule costs \$12,500.

The multiprocessor servers support Ethernet and Fiber Distributed Data Interface net interfaces and come with two RS-423 serial ports. The servers are designed to support Sun's SPARCstation line of workstations as well as personal computers.

The low-end 630MP has five VME slots and supports between 15 and 75 concurrent users. It costs \$45,000 when configured with two processors, 64M bytes of main memory, up to 1.3G bytes of disk storage and a CDRom drive. With four processors, it costs \$57,500.

The larger 670MP has 12 VME slots, supports between 25 and 100 concurrent users and costs \$60,000 in the same configuration as the two-processor 630MP. With four processors, it costs \$72,500.

The high-end 690MP has 16 VME slots, can support up to 2.6G bytes of disk storage and, when configured the same as the other machines, can support 50 to 150 concurrent users. It costs \$92,000, or \$104,500 when configured with four processors.

All three models will be available by year end, the company said.

To take advantage of the multiprocessor design, SMCC also announced an enhanced version of its Solaris 1.0 Unix operating sys-

tem. With the upgrade, the servers can support asymmetric multiprocessing in which one processor acts as the master CPU and the others function as slaves, performing compute tasks assigned by the master CPU.

The enhanced Solaris 1.0 is binary-compatible with the previous version of Solaris 1.0, meaning existing applications can run under the enhanced version without modification.

In the first half of next year, SMCC plans to unveil Solaris 2.0, which will enable the 600MP series to support symmetric multiprocessing in which all the processors have access to the system kernel and can perform compute or I/O tasks simultaneously, significantly speeding throughput.

Solaris 2.0 will be based on Unix System V Release 4, the firm said.

According to SMCC, several leading data base management system vendors have announced they are porting their software to run on SMCC's new server line.

SMCC also announced several management software packages for its new server line. These include Online: DiskSuite, \$2,500 disk-mirroring software that maintains multiple copies of data so that users can continue working if a disk or controller fails; the \$12,000 IPI Dual Port, which permits shared access to disks so that network managers can work around CPU failures; and the \$1,495 Backup Copilot, which automatically backs up Sun systems on a network. All three will be available by year end. ■

## Software lets users manage

*continued from page 4*

query the NSA Network Manager for the status of NetWare 2.X file servers and NetWare 386 servers running a variety of Netware Loadable Modules that support different applications, Hertzberg said.

"We can support those if they use IPX/SPX with SAP, and most do," he said.

Generic alerts can be sent to NetView automatically when a

NetWare server fails and filtered so the NetView operator sees only specified types of alerts.

Novell has a similar product that offers NetView support of NetWare 386 servers, but offers nothing similar for NetWare 2.X, said Craig Burton, chief executive officer of Clarke Burton Corp., a consultancy in Salt Lake City. Novell has at least 850,000 total servers installed, only 50,000 to 60,000 of which run NetWare 386, he added.

"Customers running NetWare 286 who want to connect to a

centralized system like NetView don't have a way to do that unless they upgrade," he said.

NSA plans to enhance the product to provide more control over application-layer LAN services. For example, it could be enhanced to let a NetView operator log on to a remote server and perform such tasks as adding users or changing access privileges.

"As we expand what the network manager does with execute commands, we will really attack management of the end-user services from NetView," Hertzberg

said. "That's exactly where this is going."

Cindy Santisario, senior analyst at International Data Corp. (IDC), a research company in Framingham, Mass., questioned that strategy.

"How is a company like NSA going to market that kind of a product?" she asked. "Bundled with a gateway, the product makes sense. I'm hesitant, knowing they're a small company, on how they'd be able to sell and support that going forward."

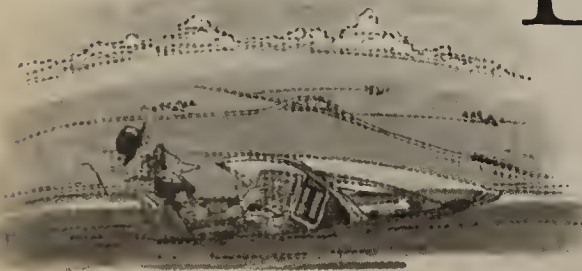
Hertzberg said the product has

been shipped to two large users, one of which plans to install it on more than 100 gateways. He declined to name the users.

The software will be generally available in January at no additional charge with the AdaptSNA Lan Gateway software, which costs \$595 for as many as four concurrent users and \$3,995 for 128 users.

Various upgrades will be offered for existing AdaptSNA users, including special lower pricing for users that buy before March 31. ■

# British Telecom Is Into The Future With Frame Relay



ExpressLANE™ accommodates heavy traffic without jams and lets transmissions run at top speed, right into an all-digital future. BT North America's powerful TYMNET® network and technology designed for the future connect your geographically distributed LANs using frame relay protocols. And we do the driving. ExpressLANE manages your LAN inter-connectivity for problem-free telecommunications. Gas up your LANs and hit ExpressLANE—your best route to inter-connectivity solutions.

BT North America, 2560 North First Street, San Jose, CA 95131-9019. Within the U.S., call 800-872-7654.



BT North America...for Network Management Systems, Global Network Services,™  
EDI Net,® Electronic Transaction Services, Dialcom® Messaging

Spirited • Solid • Strong • Worldwide Business Communications



## Network World Advertising Sales Offices

### NATIONAL SALES MANAGER

Don F. Mahlmeister  
(708) 297-8855/FAX: (708) 827-9159

### BOSTON

Donna Pomponi, District Manager  
Eleni Brisbois, Sales Assistant  
161 Worcester Road, Framingham, MA 01701  
(508) 875-6400/FAX: (508) 651-1853

### NEW YORK

Paul Bonington, District Manager  
Marlene Levis, Sales Assistant  
365 W. Passaic St., Rochelle Park, N.J. 07662  
(201) 587-0090/FAX: (201) 712-9786

### NEW JERSEY/PHILADELPHIA/D.C.

Joan Daly, Eastern Regional Manager  
Marlene Levis, Sales Assistant  
365 W. Passaic St., Rochelle Park, N.J. 07662  
(201) 587-0090/FAX: (201) 712-9786

### CHICAGO

Don F. Mahlmeister, National Sales Manager  
Dan Gentile, District Manager  
Kathy Mazzie, Sales Assistant  
10400 West Higgins Rd., Suite 300  
Rosemont, Ill. 60018  
(708) 297-8855/FAX: (708) 827-9159

### SAN FRANCISCO

Chris Curry, Western Regional Manager  
Sandra Kupiec, District Manager  
Lonnie Forbes, Sales Assistant  
Beverly Davis, Sales Assistant  
2083 Landings Drive, Mountain View, Calif. 94043  
(415) 691-0510/FAX: (415) 691-0525

### ATLANTA

Don Seay, District Manager  
Annette Johnson, Sales Assistant  
1400 Lake Hearn Dr., Suite 330, Atlanta, Ga 30319  
(404) 394-7509/FAX: (404) 255-5123

### LOS ANGELES

Karen Silverstein, Sales Assistant  
18008 Sky Park Cir., Suite 145, Irvine, Calif. 92714  
(714) 250-3006/FAX: (714) 250-4881

### RESPONSE CARD DECKS

### ACTION CENTER

### PRODUCT CLASSIFIED ADVERTISING

### RESOURCE DIRECTORY

Joan Bayon Pinsky, Sales Director  
Clare O'Brien, Account Executive Western Region  
Eleni Brisbois, Sales Assistant  
161 Worcester Road, Framingham, Mass. 01701  
(508) 875-6400/FAX: (508) 651-1853

### RECRUITMENT ADVERTISING

William Reinstein, National Sales Director  
Pam Valentinas, District Manager  
Christie Sears, Sales Assistant  
(508) 875-6400

### ADVERTISING OPERATIONS

Karen Wallace - National Account Supervisor  
Linda Miller - W. Region Account Coord.  
Barbara Hill - Classified Account Supervisor  
(508) 875-6400

### Network World, Inc.

An IDG Company  
Network World Headquarters:  
161 Worcester Road, Framingham, Mass. 01701  
Phone: (508) 875-6400/FAX: (508) 879-3167

Colin Ungaro - President  
Mary Fanning - Dir. of Financial Operations  
Nanci Farquharson - Adm. Assistant  
(508) 875-6400

### MARKETING

Evilee Thibeault - Director of Marketing  
Carol A. Leonard - Marketing Comm. Specialist  
(508) 875-6400

### RESEARCH

Ann MacKay - Research Manager  
(508) 875-6400

### CIRCULATION

Richard Priante - Director of Circulation  
Renee Visconti - Fulfillment Manager  
Bobbie Cruse - Customer Service Rep.  
(508) 875-6400

### PRODUCTION

Ann Finn - Production Director  
Cheryl Rothman - Senior Production Coordinator  
Anne Rosenkranz - Imaging Manager  
Terri Mitchell - Production Assistant  
(508) 875-6400/FAX: (508) 875-3090

### REPRINTS

Donna Kirkey - Reprint Coord./Graphic Designer  
(508) 875-6400

### LIST RENTAL SERVICES

Loel Westermann - List Rental Sales  
P.O. Box 9151, Framingham, MA 01701-9151  
(508) 879-0700

### INFORMATION SERVICES

Jeff Pennett - Director of Info. Services  
Jack McDonough - Mgr. of Info. Services  
(508) 875-6400

### DISTRIBUTION

Bob Wescott - Distribution Manager  
(508) 879-0700

### IDG

Patrick J. McGovern - Board Chairman  
Walter Boyd - President  
William R. Murphy - Vice-President Finance

*Network World* is a publication of IDG, the world's largest publisher of computer-related information. IDG publishes over 130 computer publications in more than 40 countries. Nineteen million people read one or more IDG publications each month. IDG contributes to the IDG News Service offering the latest on domestic and international computer news.

## Novell preps specs for hubs

*continued from page 6*

today's price of as much as \$150 per port. Further information on Cabletron's hub card was not available by press time.

The HMI specification will give hub card manufacturers a building standard, and the architec-

ture will accommodate hub boards made for Micro Channel Architecture, Industry Standard Architecture (ISA) or Extended ISA buses.

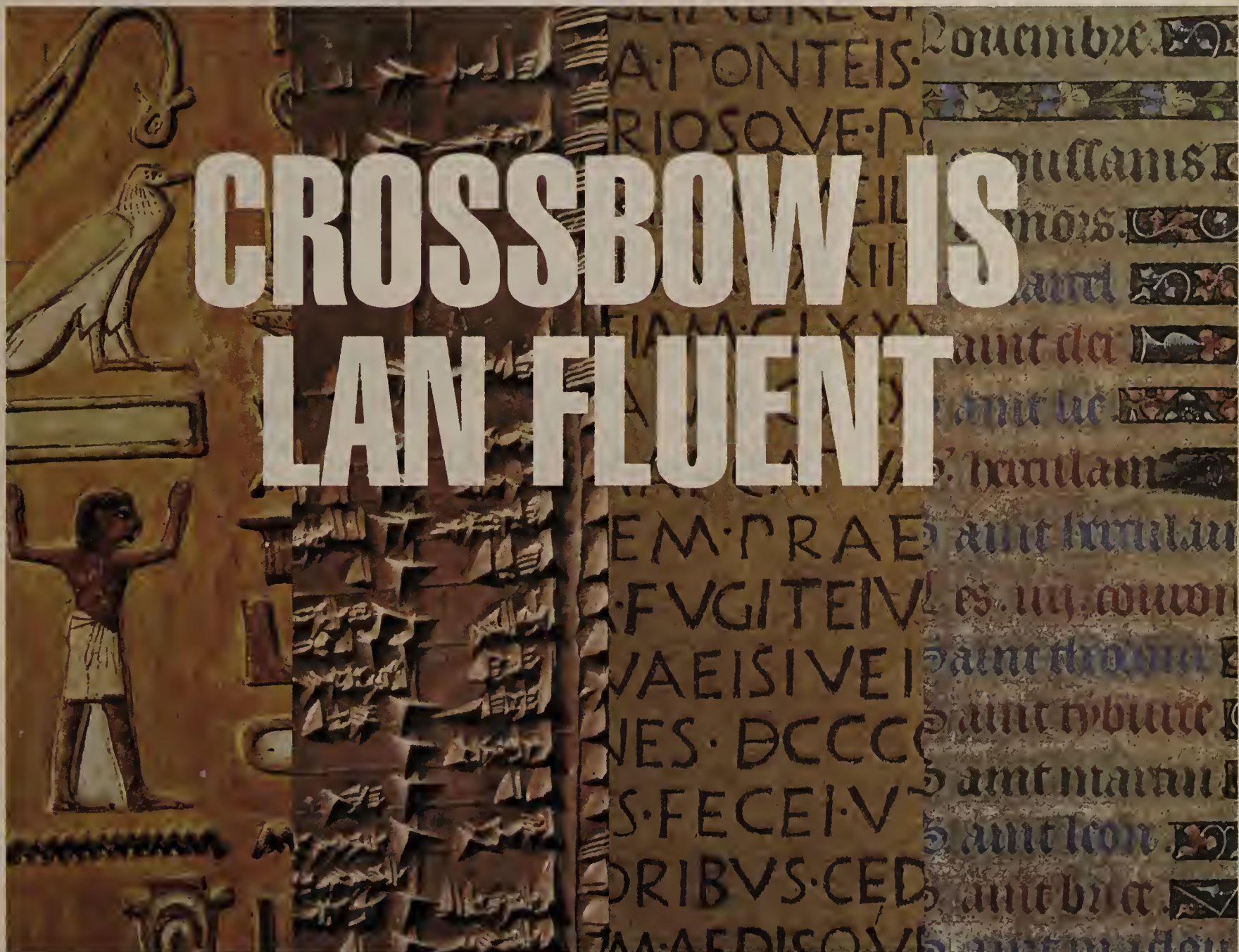
Interface drivers for the board-level hubs will be combined with the new management utility and SNMP agent as a single NetWare Loadable Module on NetWare 3.X-based servers.

The management utility, called HubCon, will let net administrators perform traditional management tasks and gather statistics about the hub and attached devices.

Users, in general, were pleased to hear that these integral hubs might drive down hub costs, but some were skeptical about the idea of having NetWare

servers doubling as hubs.

The more you stick on the server, the more you're putting all your eggs in one basket, said Edwin Wilk, network manager at WHDH-TV in Boston. If the server crashes, users will lose that much more connectivity and information, he added. And if the hub crashes, it may bring the server down with it. ☐



Mixed-protocol environments call for Crossbow, the hub that speaks so many LAN-guages. Like Token Ring at 4 and 16 Mbps. Ethernet, including 10BaseT. AppleTalk. And Apollo Domain.

Crossbow is equally fluent in all media types. So one hub easily supports shielded and unshielded twisted pair wiring, thick and thin coax, and fiber-optic cabling, linking existing and expanding LANs.

This intelligent cabling system also communicates a wide range of LAN diagnostics and status reports to your desktop through LightWatch, the hub's graphics-based network management software. And LightWatch gives you control of every port on every card in every hub.

Call Fibermux today at (818) 709-6000 for Crossbow, the most versatile cabling hub. It's LAN fluent.



### Crossbow Workstation Networking Hub

Ethernet (and 10BaseT), Token Ring, AppleTalk, and Apollo Domain  
Redundancy in Power, Modules, Links, and Ports  
Network Interface Cards and Media Converters  
Graphic Network Management with SNMP  
Multiple Logical LANs in One Hub  
20-, 40-, and 100-Port  
Hub Capacity



## Fibermux. LAN Cabling Hubs. We're Serious.

Copyright © 1990, Fibermux Corporation • 9310 Topanga Canyon Blvd. Chatsworth, CA 91311 • (818) 709-6000 • FAX (818) 709-1556

"See us at Interop, Booth #2922 and NetWorld, Booth #2602"

Circle Reader Service #123



**W**e might as well tell you right now. The new GatorBox® CS doesn't just compete with other AppleTalk-Ethernet gateways.

It eats them for breakfast.

Especially now that GatorBox CS supports DECnet™ for Mac-to-VAX/VMS networking and PATHWORKS services like terminal emulation, file sharing, printing and X windows.

#### How we attack reliability.

The new GatorBox CS is more reliable than even we thought possible.

And as network managers of some of the country's largest networks can attest, we've been known to make some *very* reliable gateways.

For one thing, there's a very



# ANY OTHER GATEWAY WOULD NEVER MAKE IT OUT OF THIS AD ALIVE.

#### GatorBox CS vs FastPath 5

Feature	GatorBox CS	FastPath 5
AppleTalk-Ethernet gateway	■	■
TCP/IP, MacTCP and IP/Talk support	■	■
DECnet Phase IV support	■	■
AppleTalk Phase 1 and 2 support	■	■
Thin, thick or 10BaseT Ethernet	■	■
Configuration, monitoring and upgrades from anywhere on network	■	■
SNMP and atalkd support	■	■
Seed, non-seed and soft-seed routing	■	
AppleTalk tunneling over IP backbone	■	
Remote gateway status via telnet	■	
Out-of-band hardware diagnostics	■	
Diagnostics written to UNIX syslog file	■	
2 MB memory	■	
Optional AppleShare-NFS file sharing	■	
Optional UNIX-AppleTalk printing	■	
Overnight replacement policy	■	
Hardware warranty	2 years	1 year
Suggested retail price	\$2,795	\$2,799

generous 2 MB of memory, making GatorBox CS particularly well-suited to high-traffic networks. And because the GatorBox

CS has built-in flash EPROM, it can recover from power outages or network failures quickly and without intervention.

Even the housing is designed to take the heat off network managers. Thanks to its vertical air flow construction, GatorBox CS runs at substantially cooler operating temperatures.

#### A killer support program.

With GatorBox CS, there's a 2-year warranty on the hardware. Not to mention guaranteed overnight replacement.

Plus, you automatically get the most experienced, most responsive service and support team in the business. Quite frankly, no one knows more about connecting AppleTalk, TCP/IP and DECnet

environments.

#### Taming the wiring beast.

Now, with GatorBox CS/Rack for 19-inch rack mount environments and GatorMIM™ CS, for Cabletron's Multi Media Access



Center™, it's simple to integrate AppleTalk into structured wiring environments.

You want to talk versatility? How about GatorBox application software. Like GatorShare™ and GatorPrint™ so you can take advantage of Mac-to-Unix file sharing and printing regardless of which GatorBox you're using.

GatorBox CS. You'll wonder how your network ever survived without it. Call 1-800-473-4776, 617-494-1999 or fax, 617-494-9270. Or write Cayman Systems, 26 Landsdowne Street, Cambridge, MA 02139.



**NOW WITH DECNET™.**